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ZOOLOGISCHE VERHANDELINGEN

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NATUURLIJKE HISTORIE TE LEIDEN

No. 44

**THE CRUSTACEA DECAPODA OF SURINAME
(DUTCH GUIANA)**

by

L. B. HOLTHUIS

LEIDEN
E. J. BRILL
12 november 1959

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70-0848

PRINTED IN THE NETHERLANDS

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L. B. HOLTHUIS

Rijksmuseum van Natuurlijke Historie, Leiden

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A. INTRODUCTION

The decapod fauna of the three Guianas (British, Dutch, and French) is very poorly known. A few scattered notes exist which deal with the crabs and shrimps of the region, but no comprehensive account of the Decapoda of any of the three countries has ever been published apart from Young's (1900) "The stalk-eyed Crustacea of British Guiana, West Indies and Bermuda", which, however, also covers the West Indian Islands and Bermuda (including the deep-water species), and furthermore is incomplete.

In the last few decades extensive collections of Suriname Crustacea have been received by the Rijksmuseum van Natuurlijke Historie at Leiden. Especially noteworthy among these is the material from the interior and the coastal area of Suriname gathered between 1938 and 1958 by Dr. D. C. Geijskes, Director of the Surinaams Museum at Paramaribo, and the collections made in 1957 by the trawler "Coquette" during fishery experiments off the Suriname coast. The "Coquette" material in the Leiden Museum forms only part of the total "Coquette" collections, which were divided between the U.S. National Museum at Washington, D.C., and the Leiden Museum.

The present paper not only contains the results of the study of the above collections, but deals with all the Suriname decapod specimens present in the collections of the Zoologisch Museum, Amsterdam; the Zoologisches Museum, Berlin; the Zoologisches Museum, Hamburg; the Rijksmuseum van Natuurlijke Historie, Leiden; the British Museum (Nat. Hist.), London; the Surinaams Museum, Paramaribo; the Museum of the Academy of Natural Sciences, Philadelphia; and the U.S. National Museum, Washington, D.C. In order to give a complete picture of the present state of our knowledge of the Suriname Decapoda, all the published data concerning these animals are also dealt with. Furthermore, practically all published figures of Suriname decapod specimens are reproduced in the present paper.

Chapter B, the first following this introduction, deals with the history of Suriname carcinology. Here, not only is the popular, scientific, and economic literature concerning Suriname Decapoda discussed, but data are also provided on the life and work of various persons who collected Decapoda in Suriname and, by making such collections available to scientists, helped to increase our knowledge of these animals. Finally, a survey is given of the various expeditions during which specimens of Suriname Decapoda have been assembled. In compiling this chapter so many interesting facts came to light that it has become longer than was originally intended; however, since many of the data given here were obtained from sources which, as a rule, are not easily accessible, it was thought useful to include all of them.

A general picture of the occurrence of Decapoda in Suriname is given in Chapter C, while in Chapter D the economic importance of these animals is discussed. The better known predators of Suriname Crustacea are dealt with in Chapter E, and Chapter F provides a list of the vernacular names of Suriname Decapoda as far as such names are known to me.

Chapter G treats the taxonomy of the Decapoda known at present from Suriname. A list of the references dealing with Suriname material is given under each species. This list is followed by an enumeration of the examined Suriname specimens of the species, arranged according to the institutions to which the material belongs; the only exception is formed by the "Coquette" material, which is listed separately for reasons of convenience, the letters W or L after each lot indicating whether the lot is preserved in the Washington or the Leiden Museum. Material from the other Guianas present in the "Coquette" collection or in the Leiden Museum is also listed. Where necessary, a description of the species is given; otherwise a reference to a published description is provided. After the remarks on the species, the type locality, general distribution and occurrence of the species in Suriname

are discussed. The text dealing with species that have not yet been found in Suriname is printed in small type.

Acknowledgements. That this paper could be written is largely due to the help and coöperation of Dr. D. C. Geijskes, Director of the Surinaams Museum at Paramaribo. Dr. Geijskes is not only responsible for obtaining a great part of the material studied, and for much important information concerning Suriname Decapoda, but he also made it possible for me to pay a short visit to Suriname (29 March to 13 April 1957), so that I could become acquainted with the commoner Suriname Decapoda in their natural habitats. Thanks to his active help and guidance I was enabled to visit numerous localities in the coastal region of the country, and to collect Crustacea there. Mr. H. W. Lijding, head of the Fisheries Section of the Department of Agriculture of Suriname, also did everything in his power to make my visit to Suriname a success, and to enable me to obtain an impression of as many habitats as I could possibly visit in the limited time available. I am likewise greatly indebted to the Department of Agriculture of Suriname for financing my Suriname trip, and for the many facilities extended to me during my stay in that country.

I am most grateful to the authorities of the Zoologisch Museum, Amsterdam, the Zoologisches Museum, Berlin, the Zoologisches Museum, Hamburg, the British Museum (Nat. Hist.), London, the Museum of the Academy of Natural Sciences, Philadelphia, and the U.S. National Museum, Washington, D.C., for the privilege of studying the Suriname Decapoda in their collections.

In compiling the chapter on the history of Suriname carcinology I obtained the assistance of many institutions and persons: I wish to express my gratitude to the Rijksarchief (Netherlands State Archives), The Hague, and to the archives of the cities of Amsterdam, Leiden, and Nyköping, Sweden, for valuable information; to many persons who collected Decapoda in Suriname, for autobiographical data; to Dr. Å. Holm, Uppsala, for information concerning Dahlberg and Rolander; to Mr. M. Skytte Christiansen, Copenhagen, for literature and information on Rolander's Suriname diary; to Drs. H. E. Gruner, Berlin, and A. Panning, Hamburg, for data concerning collectors of Suriname Decapoda preserved in German museums; and to the Evangelische Broedergemeente, Zeist, the Netherlands, for information on the missionary C. Heller. Mr. A. M. Husson, Leiden, gave me much help in my search for old literature on the Suriname fauna.

I am likewise most indebted to Dr. C. O. van Regteren Altena of the Leiden Museum for the identification of the gastropod shells inhabited by hermit crabs.

B. HISTORY OF SURINAME CARCINOLOGY

The publications providing data on Suriname decapod Crustacea can be divided into three categories: (1) popular, (2) scientific, and (3) economic. These categories will be treated separately here.

I. Popular literature. This literature mostly consists of narratives of travels in Suriname and general descriptions of the country; here crustaceans are mentioned more or less incidentally, and hardly ever indicated by a scientific name. Since relatively few species of Decapoda are found in the coastal area of Suriname, and some of them are quite characteristic, it often proves possible to identify the species mentioned in these popular accounts. The number of such popular books on Suriname published in the second half of the 17th, the 18th, and a large part of the 19th century is unexpectedly great; the fact that the country attained its greatest prosperity during that period is probably the most important cause of this abundance of publications. After the decline of the wealth of Suriname around the middle of the 19th century popular books on the country containing such economically useless information as that on quadrupeds, birds, and other animals became very scarce.

For about a century (1659-1761) the only printed information on Suriname Decapoda was to be found in books of the popular category. To my knowledge, the first published account of Suriname Decapoda is given in Otto Keye's (1659, p. 73) book "Het waere Onderscheyt tusschen Koude en Warme Landen" (The true difference between cold and hot countries). On page 73 of this book it is stated that: "De Zee ende oock de Revieren gheven mede veelder-hande slagh van groote en schoone Kreeften ende Krabben: Daer zijn verscheyden soorten van Zee-krabben, Klip-krabben, Moeras-krabben, dewelcke alle seer goedt zijn / ende oock Lant-Krabben, . . ." (The sea and also the rivers bring forth many different kinds of large and beautiful lobsters and crabs: there are various species of sea crabs, rock crabs, marsh crabs, all of which are very tasty, and also land crabs . . .); the land crabs (*Ucides cordatus*) are then dealt with more extensively. Very little is known about the person of Otto Keye. During the Dutch occupation of Brazil (1624-1654) he was captain of a company of foot soldiers there. It is possible that after the Dutch gave up their Brazilian possessions Keye went to Guiana and obtained the information published in his 1659 booklet. One of the objects of that publication was to arouse people's interest in colonizing Guiana. For in 1659 Keye was back in Holland and had joined a group of colonists under Balthasar Gerbier, Baron d'Ouvily, a Dutchman of French descent who later adopted British nationality. This group intended to found a settlement in Guiana, and evidently needed some advertising in order to get enough people together for the project. In August 1659 they

sailed from Holland and settled on the Approuague River, in what is now French Guiana. Gerbier, the head of the colony, who had taken his wife and three of his daughters with him to Guiana, was a man of great imagination and many ideas, which, however, were not always very practical. He had led quite an adventurous life. Before starting the colony in Guiana he had been a much appreciated artist, first in Holland and later at the court of James I of England; he had been British envoy at Brussels; head of an obscure academy in London; had produced many inventions, most of which proved to be without value; and was well known for his political intrigues. Keye was appointed head of the council of the new colony, and from the beginning did not get on very well with Gerbier, who was evidently not too well suited for his position. The colonists soon became dissatisfied with Gerbier—to such an extent, that he had to seek refuge in the Dutch fort of Nassau, on the island of Cayenne. On 7 May 1660, Keye, with a group of his followers, attacked Gerbier there, killing one of Gerbier's daughters and wounding another (“Dese Moordenaers siende datter twee vande Dochters in haer Bloede gewentelt lagen / meynende dat Gerbier haer Vader oock al Doot was: En hoorende 't Volck van 't Dorp saemen komen / retireerden / latende Catarina Gerbier hare laetste snicken geven / en Maria hare Suster met een doorschoten Been”: *Hollandsche Mercurius*, 1661, vol. 11, p. 83). Gerbier escaped unharmed. Otto Keye and some of his followers were taken prisoner and sent to Holland to be put on trial for murder. This incident meant the end of Gerbier's experiment. Gerbier returned to Holland, and at the end of 1660 left there for England, where he died in 1667 at the age of 75. After Gerbier's departure for England the case against Keye seems to have been dropped. At any rate, nothing more can be found about it, and no further information on Keye seems to be available (cf. De Boer, 1903, and Benjamins, 1926, both of whom also published a portrait of Keye). In 1667 or later (see De Boer, 1903, p. 11, footnote) Keye's book was republished anonymously under the new title “Beschryvinge Van het Heerlijcke ende Gezegende Landt Guajana” (Description of the wonderful and blessed country of Guiana), while in 1672 a German edition was issued. An English version of Keye's book seems to have been published by Gerbier under his own name in 1660.

Keye's account of the Crustacea is reproduced almost verbatim in an anonymous publication (Anonymus, 1676, pp. 39, 40), which proves to be a compilation of all the information on Guiana known at that time. The source of the information is duly given.

Maria Sybilla Merian (born Frankfurt a/Main, Germany, 4 April 1647; died Amsterdam, 13 January 1717), a well-known painter of flowers and

insects, married Johann Andreas Graff at Frankfurt on 16 May 1665. In 1685 she left her husband and, with her two daughters, went from Frankfurt to Wieuwerd in Friesland, the Netherlands, where she joined the Labadist sect. In 1691 she left Friesland and settled in Amsterdam, where, apart from a visit to Suriname, she lived till her death in 1717. In June 1699 Maria Merian departed by boat to Suriname. After having stayed about two years in that country, she returned to Holland for reasons of health, around June 1701. The greater part of her time in Suriname was spent in the Labadist colony of La Providence, on the Suriname River, about 65 km from the coast. Here she made numerous exquisite paintings of Suriname plants and animals (mostly insects), which were first published in 1705. On one of her plates a hermit crab (*Clibanarius vittatus*) is shown; this is also found in the many later editions of her work.

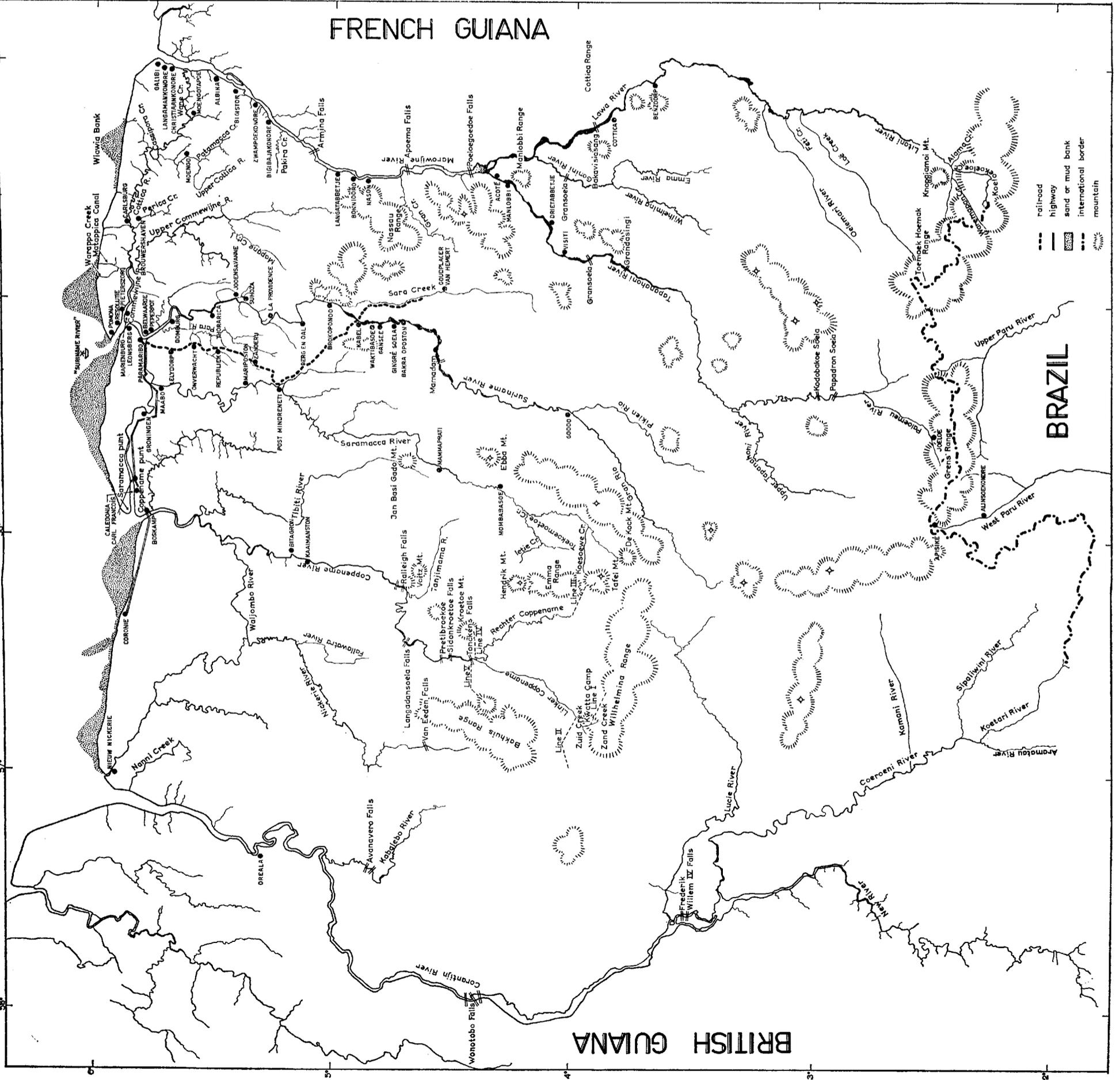
On pp. 200-202 of his 1718 "Beschryvinge van de Volk-Plantinge Zuri-name" (Description of the colony of Suriname), J. D. Herlein, who wrote over the initials J. D. Hl., published an account of several Crustacea, among them large lobsters, named "Homars", which he stated to be "zo groot dat'er maar eenen van noden is om eene Schotel te vullen; haar Vlees is wit en smakelijk, maar wat hard om te verteren. d'Indianen vangen haar by nagt op het zand, of op de platen van de zee; en met de hulpe van een Toortsligt of de helderheid van de Mane, zo door-rijgen zy haar met eene kleine yzere vorke". If we compare this account with what De Rochefort (1665, p. 222) in his "Histoire naturelle et morale des Iles Antilles de l'Amérique" said about the Antillean "Homars" (*Panulirus argus* (Latr.)): "Mais elles sont si grosses, qu'il n'en faut qu'une pour remplir un grand plat. Elles ont la chair blanche & savoureuse, mais un peu dure à digeter. Les Insulaires les prennent pendant la nuit sur le sable, ou sur les basses de la Mer, & à l'aide d'un flambeau ou de la clarté de la Lune, ils les enfilent avec une petite fourche de fer", then it becomes clear that Herlein's account is not based at all on Suriname lobsters, but is a mere translation of De Rochefort's text dealing with *Panulirus argus* from the Antillean Islands. Herlein's other descriptions of Crustacea, viz., his "Kreeften", "Krabben die men Tourlourou noemt", "Witte Krabben", and "Beschilderde Krabben", are likewise nothing but translations of De Rochefort's (1665, pp. 223, 253-258) descriptions of his "Cancre" (various species of crabs), "Crabes qu'on nomme Tourlourou" (*Gecarcinus* spec.), "Crabes blanches" (*Cardisoma guanhumi* Latr.), and "Crabes peintes" (*Gecarcinus* spec.), all of which are true Antillean forms that do not or only rarely occur in Suriname. Accordingly, Herlein's account, not being based on Suriname Decapoda, should be left altogether out of consideration here. Some later authors made use of

Herlein's book in describing Suriname, thereby perpetuating his arroneous Crustacean records. For instance, Pistorius (1763, p. 85) merely gave an abbreviation of Herlein's text, e.g., "*Kreeften zyn hier mede in overvloed en in soorten, waar van de grootste zyn, die men Homars noemt; van deeze één, kan men een groote Schootel vullen . . .*" etc.; the white and the painted crab are also dealt with by Pistorius, whose book, like Herlein's work, consequently does not really contain any information on Suriname Decapoda.

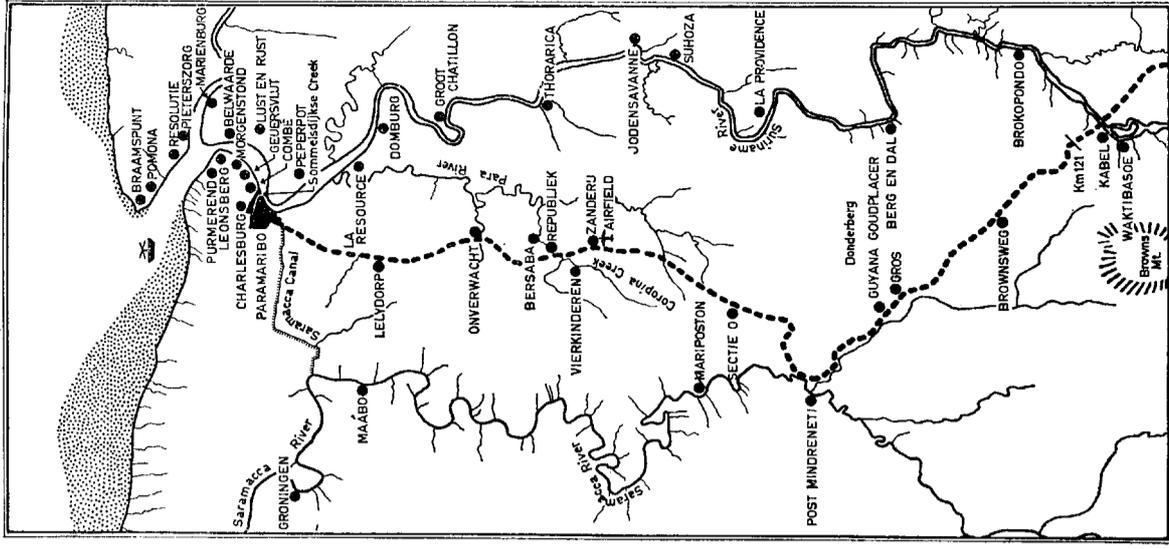
Philip Armand Fermin (born Berlin, Germany, 5 May 1729, died Maastricht, 7 January 1813), a physician who lived in Suriname from 1754 to 1762, published several books on that country after his return to Holland. In two of these publications the natural history of Suriname is dealt with and some attention is given to the decapod Crustacea. In his 1765 "*Histoire naturelle de la Hollande équinoxiale*" Fermin divided the animals into three groups: 1. Quadrupèdes et Reptiles; 2. Des Oiseaux, Poissons, et Testacées; 3. Des Insectes, Vers et Papillons. To each group a special chapter is devoted, in which the animals are arranged alphabetically under their French names. The "Crabe" and the "Ecrévisse" are placed in group 2. Under "Crabe" Fermin listed five species: "Le Crabe au pied large" (= *Callinectes bocourti*), "le Crabe jaune" (= ? *Ucides cordatus*), "le Crabe marbré" (= ? *Goniopsis cruentata*), "le Crabe blanc" (= *Ocypode quadrata*), and "le Crabe appellé soldat" (= ? *Aratus pisonii*). After listing these species Fermin continued with the remark: "Le Crabe de terre qui est abondant dans toute l'*Amérique*, se divise en plusieurs espèces qu'on appelle *Tourlouroux*, & qui sont les plus délicats. Les Crabes violets, les Crabes blancs & les Cériques, sont les trois espèces qui me sont connus". Fermin's information about the terrestrial crabs was evidently taken from Labat (1724, vol. 1 pt. 2, pp. 47-53), who described the species "Tourlouroux" (p. 47) (= *Gecarcinus spec.*), "Crabes violettes" (p. 50) (= *Gecarcinus spec.*), "Crabes blanches" (p. 50) (= *Cardisoma guanhumi* Latr.), and "Cirique" (p. 53) (= *Pseudothelphusa* or *Callinectes*) from Martinique. The Suriname species identified by Fermin with "Crabes violets", "Crabes blancs" and "Cériques" are undoubtedly not the species meant by Labat, but belong to *Ucides cordatus*, *Ocypode quadrata* and *Callinectes bocourti*, respectively. Fermin ends his chapter on the crabs with the remarks that "Toutes ces différentes espèces de Crabes sont très-excellentes à manger", and with indications as how to cook them in order to make them easily digestible. The only species mentioned under "Ecrévisse" is evidently *Macrobrachium carcinus*. Some of the names used by Fermin, viz., *Cancer albicans minor littoralis*, *Astacus major*, and Crabe appellé soldat, are undoubtedly taken from Barrère's (1741) "Essai sur l'histoire naturelle

de la France équinoxiale" (pp. 183, 184), on which book Fermin's "Histoire naturelle" is modelled. In his 1769 "Description générale... de la colonie de Surinam" Fermin dealt with the animals systematically, and hence the "écrevisses" and "crabes" are placed together. The text on the Crustacea is quite different from that of his 1765 "Histoire naturelle", and proves to be largely copied from Labat's (1724) "Nouveau Voyage aux Isles de l'Amérique" (vol. 1 pt. 1, p. 105 "Ecrevisses"; vol. 1 pt. 2, pp. 47-53 "Crabes"). The first line of Fermin's text on "Des Ecrevisses" (p. 274) is copied almost literally from Labat, while the second is similar to the text in his 1765 book. The accounts of the four species of crabs: Crabe de terre, *Cancer terrestris, minor* (p. 275), la Violette, *Cancer violaceus* (p. 276), Crabe blanche, *Cancer albicans, minor* (p. 276) and Cirique, *Cancer parvus* (p. 277) are copied practically word for word from Labat's accounts of Tourlouroux, Crabes violettes, Crabes blanches, and Ciriques, respectively. As Labat's crabs originate from Martinique, and belong to species that do not or seldom occur in Suriname, Fermin's account is quite misleading. From his earlier publication we know that Fermin was actually acquainted with various species of Suriname crabs, and hence the names given by him in 1769 are intended for true Suriname species, to which, however, his descriptions do not apply. This leads to peculiar inconsistencies, such as the following. By the name *Cancer albicans, minor* Fermin obviously meant to indicate *Ocypode quadrata*, which is indeed a rather small form compared with, for example, *Ucides cordatus*. The description, however, is that of the large *Cardisoma guanhumi*; the sentence in this description "Elle est d'une espece plus grosse que la précédente" is true of *Cardisoma*, but not of *Ocypode*. The preceding species, namely, is *Cancer violaceus*, by which name Fermin meant to indicate *Ucides cordatus*, while the description is that of a *Gecarcinus*, which never attains the size of *Cardisoma guanhumi*. Fermin's *Cancer terrestris, minor* is probably one of the smaller grapsoid crabs, though the description is that of a species of *Gecarcinus*. His "Cirique" is evidently the Suriname "Sirika", *Callinectes bocourti*; the description is that of a *Pseudothelphusa* or *Callinectes* from Martinique.

In 1769 Edward Bancroft (born 1744, died 1821), an English physician, chemist and naturalist, who made several visits to both North and South America and lived in Demerara for some time, published his "An Essay on the Natural History of Guiana", which deals with Suriname and Demerara, at that time both Dutch possessions (cf. p. iii of Bancroft's introduction: "It is necessary to inform the Reader, that the Author's Observations on this Subject have been confined within the limits of the Dutch territories in Guiana"). In this book Bancroft dealt rather extensively with the "Land-



Map 1. Suriname.



Map 2. Coastal region near and south of Paramaribo.

Crab" (*Ucides cordatus*) of that region, but he paid no attention to the other Crustacea. A German (1769) and a Dutch (1782) edition of Bancroft's book were subsequently published.

Jan Jacob Hartsinck (born Amsterdam, 14 October 1716, died Amsterdam 28 October 1779), who occupied an important post in the Dutch West India Company, published a now classic description of Guiana in 1770. A German translation of this appeared in 1780. As Hartsinck never visited the Guianas himself, most of his information on the natural history of the region was necessarily obtained from previous authors. The greater part of his data on Crustacea were taken from Fermin (1765).

John Gabriel Stedman (born in the Netherlands in 1744, died Tiverton, England, 7 March 1797), an officer of the Scottish Brigade in the Netherlands, accompanied the troops that were sent to Suriname in 1773 to help suppress a revolt among the negroes there. Stedman stayed in Suriname till 1777, when he returned to the Netherlands, which he left for England in 1783. In 1796 the first of two English editions of his "Narrative of a five years' expedition, against the Revolted Negroes of Surinam" was published. This first English edition was soon followed by translations into French (1798) and Dutch (1799-1800), and abridged editions in German (1797, 1797a), Dutch (1799a), and Swedish (1800a). The second volume of the second English edition was published in 1806, the first volume in 1813. In this work the natural history of Suriname is quite well treated; of the Crustacea, the swimming crab, *Callinectes bocourti*, and the river prawn, *Macrobrachium carcinus*, are mentioned.

J. D. Kunitz, a German, spent almost 20 years in Suriname (evidently arriving there in the Dutch colonial forces and ending up as manager of a plantation). In 1805 he published a book, "Surinam und seine Bewohner", in which some attention is paid to the animal kingdom. The only crustacean dealt with is the land crab, *Ucides cordatus*.

In 1810, Baron Albert von Sack, a German nobleman, who spent several years (1805-1807, 1810-1812) in Suriname for the benefit of his health, published an account of his experiences during his first stay in that country. The original edition of his book is in English, because the political situation in Europe made it impossible for Von Sack to return to his home country, and he sought refuge in England, which he left in 1810 for a second visit to Suriname. Von Sack mentioned three species of "Land Crabs" (p. 274); one of these species, which is said to be "small and of a gray colour", may have been any of the smaller grapsoids, the others can be identified as *Ucides cordatus* and *Ocyfode quadrata*. Von Sack's account was later (1821) published in German and Dutch editions; in both of them his second stay in Suriname

is also dealt with. No additional information on Crustacea is contained in either of these editions.

Marten Douwes Teenstra (born Oldehove, Groningen, 17 September 1795, died Ulrum, Groningen, 29 October 1864) was the son of a Groningen farmer. After having spent some time in the East Indies, Teenstra was appointed Government Agriculturist in Suriname, where he stayed from 1828 to 1834, during which period he paid some visits to the Netherlands Antilles. In 1835, after his return to the Netherlands, Teenstra published his "De Landbouw in de Kolonie Suriname" (The agriculture in the Colony of Suriname), a book which contains a wealth of information on the natural history of the country. Teenstra, like most of his predecessors, indicated the various Decapoda discussed by him by non-scientific names. He is the first to mention the occurrence in Suriname of the marine prawn *Xiphopenaeus kroyeri*. He dealt also with *Macrobrachium carcinus*, *Ucides cordatus*, *Callinectes bocourti*, *Goniopsis cruentata*, and *Clibanarius vittatus*, and reported upon a majid, which is possibly *Libinia ferreirae*.

Pierre Jacques Benoit (born Antwerp, 1782, died Brussels, 1854), a Belgian artist, spent some time in Suriname, and afterwards published his "Voyage à Surinam", containing 49 plates depicting the country and the people of Dutch Guiana. In the text Benoit made a casual mention of the river prawn, *Macrobrachium carcinus*, and of crabs in general.

August Kappler (born Mannheim, Germany, 10 November 1815, died Stuttgart, Germany, 20 October 1887), was the last and also the best of the popular authors dealing with the country and natural history of Suriname as a whole. His accurate and original observations make his books still the most important sources of information on the Suriname species of many animal groups. Kappler first went to Suriname in January 1836, as a soldier in the Dutch Suriname detachment; he stayed there till 28 November 1841. After having spent a short time in Germany he returned to Suriname in 1842, and, apart from two short visits to Europe (June 1845-March 1846, and September 1852-June 1853), stayed in that country till 1879, when he returned to Germany, a rich man. During his second stay Kappler made his money mainly by trading in timber, farming, and selling natural history specimens. He spent most of his time in Albina, a village on the Marowijne River, which he founded in 1846 and named after his wife. In 1881 Kappler published his "Holländisch-Guiana", in which several crabs (*Ucides cordatus*, *Callinectes bocourti*) and prawns (*Xiphopenaeus kroyeri*, *Macrobrachium carcinus*) are dealt with. In his later (1887) work "Surinam" the Crustacea are more extensively treated and, in addition to the just named species he mentioned "Pagurus" (= *Clibanarius vittatus*), "Sandkrabbe" (= *Ocyropode*

quadrata), and "eine Seespinne, *Maja*" (= probably *Libinia ferreirae*). He spoke of "kleinen Krabbenarten, die kaum fingerbreit in den brennendsten Farben von rot, braun, gelb und blau unter den Mangrovenbäumen sich aufhalten. Sie sind zu klein, um gegessen zu werden, und nur Krehshunde (Procyonen), eine Eule, ein kleiner Falke und Wasservögel stellen ihnen nach". These, of course, are several species of small grapsoid crabs such as *Sesarma*, *Goniopsis*, *Aratus*, etc. Kappler was the first person to point out that the crustacean fauna of Suriname, though rich in individuals, is poor in species, as "die surinamische Küste vom französischen bis ins britische Guiana ganz flach ist und meistens aus einem blauen Lehm besteht, der bei jeder hohen Meeresflut überströmt wird, nirgends Felsen daran vorkommen und nur einige Sandbänke das schlammige Ufer unterbrechen, das Seewasser trübe und wegen der Einmündung bedeutender Flüsse weniger salzhaltend ist, so kommt auch hier nicht die so interessante Meeresfauna von Korallen, Muscheln, Seesternen, Langusten und Seekrebsen vor, die man an anderen Küsten des tropischen Amerika's findet".

The present category might also include the narratives of the various expeditions to the interior of Suriname, in which Crustacea are sometimes mentioned. The identity of the crustaceans cannot be made out from the information given in these publications alone, but only by study of the actual specimens, most of which are now preserved in the Leiden Museum (see also pp. 34-41).

II. Scientific literature. This relates in the first place to actual specimens and their taxonomy; the authors of the papers in this category usually deal with preserved specimens which have been collected by other persons. Information on Suriname Decapoda in scientific publications is extremely meagre and consists mainly of the occasional mention of such animals in papers treating Crustacea from other regions.

The first scientific publication containing information on Suriname Crustacea is the third volume (1761) of "Locupletissimi Rerum Naturalium Thesauri" by Albert Seba (born Etzel, Ost Friesland, Germany, 2 May 1665, died Amsterdam, 2 May 1736), an Amsterdam apothecary of German descent, who owned an extremely rich collection of natural history objects. The Crustacea figured in Seba's Thesaurus include two that are said to originate from Suriname. These are "Squilla, Crangon, Americana, major" (= *Macrobrachium carcinus*) and "Squilla, Crangon, Americana, altera" (= *Panulirus guttatus*). The figures of these species are so excellent that their identity is not open to the least doubt.

The first Suriname decapod to receive a binominal name is *Ucides corda-*

tus, which was published under the name *Cancer cordatus* by Linnaeus (1763) in the thesis "Centuria Insectorum" of his pupil Boas Johansson. The type material of *Cancer cordatus* was collected in Suriname by C. G. Dahlberg (see p. 17). The Suriname record of *Cancer cordatus* was repeated by many subsequent authors (Linnaeus, 1767; Houuttuyn, 1769, who gave an original figure of the species; Fabricius, 1775, 1793; Stadius Müller, 1775; Herbst, 1783; Olivier, 1791; Latreille, 1802-1803b).

In 1778, Baron Carl de Geer (born 1720, died Stockholm 1778), a Swedish nobleman and noted entomologist, published in the seventh volume of his "Mémoires pour servir à l'histoire des Insectes" a very extensive and well-illustrated description of *Goniopsis cruentata*, based on Suriname material collected by Daniel Rolander (see p. 19); unfortunately De Geer indicated the species by the incorrect name *Cancer ruricola* L. It is probable that De Geer's *Cancer pelagicus* is *Callinectes bocourti*, and that his *Cancer vocans* is *Uca rapax*, while his material of both may also have been collected in Suriname by Rolander. There is some confusion concerning the correct spelling and origin of the family name De Geer, which by some authors is written Degeer. The origin of the De Geer family is not to be found in France, Germany or Holland, as is often maintained, but in the French-speaking part of Belgium. Louis de Geer et de Gaillarmont (1535-1602) came from Liège, Belgium; the family name De Geer being derived from the name of a small river (Geer in French, Jeker in Dutch), which flows through N.E. Belgium, joining the Meuse River on Dutch territory at the town of Maastricht. The name "De Geer" is also that of a castle close to Liège. Louis de Geer (1587-1652), a son of the above, left Belgium, since he was of the Protestant religion, and finally settled in Amsterdam, where he became a very prominent figure in the business world. He dealt mainly in implements of war and, by selling these to Sweden, acquired many interests in that country, including concessions in the Swedish mining area, where he finally became the owner of a flourishing steel concern. He was a very influential person both in Holland and Sweden, and was made a member of the Swedish nobility. He had 14 children, some of whom settled in Sweden and some remained in Holland; at present the De Geers belong to the most prominent families in both countries.

In 1822 Gabriel Daniel Collin (born Stockholm, 24 April 1800, date of death unknown), a pupil of the well-known biologist Professor C. P. Thunberg, who was Linnaeus's successor at Uppsala University, published a thesis entitled "Fauna Surinamensis". Collin, who became a schoolteacher on completion of his studies, never visited Suriname, and his pamphlet contains a mere list of names of the animals reported from Suriname by Gmelin and

Fabricius (cf. Holthuis, 1958a, pp. 71-85). The list is not critical, and is incomplete and inaccurate, but is nevertheless interesting as a first attempt to compile a check list of the animals of Suriname. The only decapod mentioned is *Cancer cordatus* L., though at that time no less than 7 species (*Macrobrachium carcinus*, *Panulirus guttatus*, *Clibanarius vittatus*, *Callinectes bocourti*, *Goniopsis cruentata*, *Ucides cordatus*, and *Ocyrode quadrata*) had been reported from Suriname. However, most of these had only been mentioned in popular literature, and at that time had not yet obtained a scientific name.

Dr. Wilhem de Haan (born Amsterdam, 7 February 1801, died Haarlem 15 April 1855), who was in charge of the Division of Invertebrates of the Leiden Museum from 1823 to 1846, contributed the Crustacea volume (1833-1850) to P. F. von Siebold's *Fauna Japonica*. In this work he made mention of a species of *Sesarma* (*S. rectum*) from Suriname, to which, however, he did not give a name. In the same volume De Haan dealt with two species (named *Palaemon Lamarrei* H. Milne Edw. and *Palaemon brevicarpus* nov. by him) which he thought to originate from Japan, but which actually came from America (presumably from Suriname) and, as shown by later authors (De Man, 1879; Sunier, 1925; Holthuis, 1952), proved to belong to *Macrobrachium amazonicum* and *M. carcinus* respectively. De Haan's Suriname material was collected by H. H. Dieperink (see p. 21); to honour this collector De Haan even named a species after him, *Palaemon Dieperinkii*, but neither the description nor the name were published by De Haan. It was De Man (1879) who unearthed this name when he studied De Haan's type material; in the meantime, however, the species had already received a name from another author (cf. *Macrobrachium amazonicum*, p. 85).

An important contribution to Suriname carcinology was made by Dr. J. W. Randall, a Boston physician, who in 1840 published the description of no less than four new species, the material of which was collected in Suriname by Dr. C. Hering (see p. 23). The specific names of two of these species are still valid (*Potamocarcinus latifrons*, and *Sesarma rectum*), the other two names being synonyms of *Goniopsis cruentata* and *Clibanarius vittatus*, respectively. Some of this material has been dealt with by later authors (Kingsley, 1880; Ortmann, 1897; Rathbun, 1905).

Carl Gottfried Semper (born Altona, Germany, 1832, died Würzburg, Germany, 1893) obtained his doctor's degree in zoology at Würzburg University and later, after having travelled in Europe and the Philippines, became lecturer (1866) and professor (1869) at the same university. In 1869, in a paper on the genus *Macrobrachium*, he mentioned the presence of Suriname material of *M. carcinus* in the collection of the British Museum; the collector of this material is unknown.

In his doctor's thesis Richard Neumann (1878) gave a catalogue of the Crustacea Podophthalmia of the Heidelberg Museum. Among them he listed Suriname material of six species: "*Actaea setigera* Milne Edw.", "*Calappa marmorata* Fabr.", "*Scyllarus aequinoctialis* Fabr.", "*Ibacus antarcticus* Fabr.", "*Callianidea typha* Milne Edw.", and "*Gonodactylus chiragra* Fabr." As none of these species has ever been reported from Suriname either before or since, and as the ecology of several of them, if not of all, makes it highly unlikely that they were collected on the muddy Suriname coast, it seems very probably that they have been incorrectly labelled as to locality, and that they actually originated from the West Indian Islands.

Johannes Govertus de Man (born Middelburg, 2 May 1850, died Middelburg, 19 January 1930) studied biology at Leiden University and obtained his doctor's degree there in 1873. He was one of the foremost Crustacea specialists of his time, and from 1872 to 1883 was in charge of the invertebrate collections of the Leiden Museum; afterwards he lived in retirement in the Dutch province of Zeeland, giving all his time to taxonomic research on decapod Crustacea and Nematoda. He was most interested in the Indo-West Pacific Decapoda, but in a few cases dealt with Suriname material. As already pointed out above, De Man (1879) published the manuscript name *Palaemon Dieperinkii* De Haan, while at the same time he drew attention to the fact that De Haan's so-called Japanese specimens of *Palaemon Lamarrei* are indistinguishable from South American specimens of the species which is now called *Macrobrachium amazonicum*. In 1892 De Man described and figured specimens of a *Sesarma* collected in Suriname by Dr. H. F. C. ten Kate, which he identified as *Sesarma recta* but which later proved to represent a distinct species, for which a new name was proposed by two authors almost simultaneously (*S. benedicti* Rathbun, 1897, and *S. chiragra* Ortmann, 1897). Later (in 1912 and 1925) De Man briefly mentioned Suriname material of *Macrobrachium acanthurus* and *M. carcinus*, the collector of which is unknown and which is still preserved in the collection of the Leiden Museum.

John Sterling Kingsley (born Cincinnatus, N.Y., U.S.A., 7 April 1854, died Berkeley, Calif., U.S.A., 29 August 1929) obtained his Sc. D. degree at Princeton University in 1885. Between 1887 and 1921 he was Professor of Zoology at the University of Indiana (1887-1889), the University of Nebraska (1889-1892), Tufts College (1892-1913), and the University of Illinois (1913 till his retirement in 1921); from 1876 till 1878 he occupied the post of Curator of the Peabody Academy of Science. In 1880, in his Synopsis of the Grapsidae, Kingsley dealt with Suriname Crustacea collected by C. Hering. Some of these had already been reported upon by Randall, but the

first mention of one of them (*Planes minutus*) was made on this occasion by Kingsley.

In 1892 Johann Thallwitz, who was Assistant Curator of the Royal Zoological Museum of Dresden, Germany, and later became a teacher at a secondary school in that town, published a catalogue of the Decapoda and Stomatopoda of the Dresden Museum. In this catalogue material of *Pericera cornuta* (= *Stenocionops furcata*) is mentioned as being from Suriname; the collector is unknown.

Arnold Edward Ortmann (born Magdeburg, Germany, 8 April 1863, died Pittsburg, Pa., U.S.A., 3 January 1927) studied at the universities of Kiel, Strasbourg, and Jena, and obtained his doctor's degree in 1885. On his return from an expedition to Zanzibar, Ortmann became instructor at Strasbourg University; in 1894 he settled in the U.S.A. At first Curator at Princeton University (1894-1903), he later became Curator at the Carnegie Museum in Pittsburgh (1903-1927) and professor at Pittsburgh University (1910-1927). In a catalogue of the Decapoda of the Strasbourg Museum, Ortmann (1894) mentioned Suriname material of *Ucides cordatus* (collector unknown), while later (1897) he published the results of a re-examination of some of Randall's Suriname types, and suggested the new name *Sesarma chiragra* for a species based on Suriname material which De Man (1892) had incorrectly identified with *Sesarma rectum*.

Mary Jane Rathbun (born Buffalo, N.Y., U.S.A., 11 June 1860, died Washington, D.C., U.S.A., 4 April 1943) became a clerk with the U.S. Fish Commission in 1884 and transferred in 1886 to the U.S. National Museum, Washington, D.C., where she was appointed copyist in the Division of Marine Invertebrates. Later she became aid, and finally Assistant Curator of that division. In 1914 she resigned this post so as to permit the appointment of an assistant, which appointment would otherwise have been impossible for financial reasons. However, Miss Rathbun continued her research work at the Museum, now with the title of Honorary Associate, until 1939, when her health finally prevented her from leaving her home. In 1917 she obtained her doctor's degree. Miss Rathbun is best known for her fundamental monographs on American crabs, while she also published numerous other papers on decapod Crustacea. In one of these papers (Rathbun, 1897) she proposed a new name, *Sesarma benedicti*, for a species, based on Suriname specimens, which De Man had previously incorrectly identified with *Sesarma rectum*. In 1905 Miss Rathbun described a new species of fresh-water crab, *Pseudothelphusa wymani*, the type material of which was collected in Suriname by Professor Jeffries Wyman.

Sir D'Arcy Wentworth Thompson (born Edinburgh, 2 May 1860, died

St. Andrews, Scotland, 21 June 1948) studied at Edinburgh and Cambridge, and in 1884 became Professor of Biology at Dundee, a post which he occupied till his death in 1948. In a catalogue of the Crustacea of the Dundee Museum, Thompson (1901) made mention of three species of Decapoda from Suriname (*Macrobrachium amazonicum*, *Ucides cordatus* and "*Gelasimus vocator*"; the latter being a species of the genus *Uca* whose correct identity cannot be ascertained). The collector of this material is not known; it might have been W. Gillespie (see p. 27).

Johan Jacob Tesch (born Amsterdam, 7 February 1877, died The Hague, 7 August 1955) studied biology at the universities of Leiden and Utrecht and obtained his doctor's degree in 1906. From 1907 to 1908 he was Assistant Curator, and from 1915 to 1918 Curator of the Division of Crustacea of the Leiden Museum. Except for these two periods he was connected continuously with the Netherlands Institute for Marine Research from 1906 to 1942, starting as a second assistant and ending as head of the institute. After his retirement in 1942 Tesch became an honorary associate of the Leiden Museum. In 1914 he published the chapters "Callinectes", "Crustacea", and "Gecarcinidae" of the Encyclopaedie van Nederlandsch West-Indië, which were partly based on material present in the Leiden Museum. Some information on Suriname *Callinectes bocourti*, *Ucides cordatus*, *Sesarma rectum*, *S. benedicti*, *Pseudothelphusa denticulata*, *Potamocarcinus latifrons*, *Ocypode quadrata*, and *Macrobrachium carcinus* can be found there. Tesch's supposition that *Atya scabra* (Leach) might be found in Suriname has not yet been substantiated. In his 1917 paper he dealt with the Suriname material of *Sesarma benedicti* and *S. rectum* present in the Leiden Museum and collected by Dr. H. F. C. ten Kate, Dr. M. D. Horst, and Jhr. W. C. van Heurn.

Armand Louis Jean Sunier (born Rotterdam, 17 December 1886) studied biology at the universities of Leiden and Groningen, obtaining his doctor's degree at the latter university in 1911. From 1911 to 1923 Sunier worked as a fisheries biologist in Batavia, Netherlands East Indies. In 1923 he was appointed Curator of Crustacea at the Rijksmuseum van Natuurlijke Historie at Leiden. In 1927 he relinquished this post for that of Director of the Amsterdam Zoo, which he occupied till his retirement in 1953. As Curator of Crustacea at Leiden Sunier published in 1925 a short note on Palaemonidae, in which he mentioned Suriname material of *Macrobrachium amazonicum* from the Leiden collection.

Adriaan Reyne (born Uitgeest, 1890) studied biology at Utrecht University and obtained his doctor's degree there in 1926. From August 1918 till July 1925 Reyne was entomologist at the Agricultural Experiment Station of Suriname. After teaching in a secondary school in Holland from 1925 till

1927, he accepted a position as biologist in the Netherlands East Indies, where he stayed till 1933, when he returned permanently to the Netherlands. In 1922, in his function of entomologist at the Suriname Agricultural Experiment Station, he sent some Crustacea from trenches near Paramaribo to the U.S. National Museum, Washington, D.C., for identification. The results of the identification were published by Reyne in 1923; one of the species proved to be *Macrobrachium jelskii*.

The present author dealt with Suriname Decapoda in a number of taxonomic papers (Holthuis, 1948, 1950, a, b, 1951, 1952, 1958).

In 1957 Dr. Teresita Paulucci née Maccagno, Curator of the Istituto e Museo di Zoologia dell'Università, Turin, Italy, and her pupil B. Cucchiari, published a revision of the Palaemoninae of the Turin Museum, in which paper mention is made of Suriname material of *Palaemonetes carteri* and *Macrobrachium jelskii*, obtained as a gift from the Leiden Museum.

III. Economic literature. This deals exclusively with the Suriname prawn fishery and dates from the last 25 years.

Johnson & Lindner (1934, p. 80) noted that in Suriname "fresh shrimp are taken from the river and dried shrimp are imported in large quantities from the United States". E. J. Reyntjes (1953, 1954), who from April 1949 to August 1953 was the head of the Fishery Section of the Suriname Department of Agriculture, and his successor, H.W. Lijding (1956, 1957), dealt with Suriname prawns from an economic viewpoint and discussed the fishery of these animals (see under *Xiphopenaeus kroyeri* and *Palaemon schmitti*); also Dr. D. C. Geijskes published two papers (1948, 1954) on this subject. A survey of the Suriname prawn fishery was given by Lindner (1957, p. 153).

IV. Collectors. The scientific papers dealt with in paragraph II are based on material collected by various persons, to whom science is much indebted for making this material available to scientists. The importance of the rôle played by collectors is often underestimated, and in several cases even their names are unknown. It seems therefore only fair to include in this chapter on the history of Suriname carcinology a paragraph dealing with the known collectors of Suriname Decapoda and their activities; the enumeration given here is in a chronological order.

Carl Gustaf Dahlberg (born Nyköping, Sweden, 1721, died Paramaribo, 6 September 1781) was of Swedish nationality and in 1743, during the Finnish war, served as a gunner in the Swedish army; in the same year he took part in the defense of Stockholm during the Dalecarlian revolt. He went to

Suriname as a corporal in the Dutch forces, arriving there probably in the end of 1746. He was accompanied by two other Swedes and was extremely poor: he boasted later that two small silver coins were all the money in his possession when entering Suriname. Nevertheless he seems to have had a letter of recommendation (dated 7 September 1746) from the directors of the "Suriname Society" of the Dutch West India Company to the Governor General of Suriname, J. J. Mauricius. On 3 May 1748 Dahlberg was promoted to the rank of sublieutenant; he left the service on 1 March 1752. When in Suriname he married, 13 March 1751, Johanna Catharina Bedloo, the rich widow of captain C. Brouwer, who was characterized by Governor General Mauricius as an impudent shrew, "een der impertinenste helleveegen". By his marriage Dahlberg became the owner of the plantations Brouwershaven with about 100 slaves situated on the Perica Creek, and Carlsburg with about 40 slaves on the Cottica River. He owned these plantations till his death; Teenstra (1835, pp. 54, 58) noted that in 1830 both plantations were abandoned. Dahlberg became one of the wealthiest citizens of Suriname, and from 19 November 1753 to 5 February 1754 (before his departure for Europe) he occupied the important post of "Raad van Policie en Crimineele Justitie" (Councillor of Police and Criminal Justice). His military rank eventually was that of "overste-luitenant" (lieutenant-colonel). On 20 April 1754 Dahlberg left Suriname to visit Sweden, and when he returned on 21 June 1755, he took Daniel Rolander (see below, p. 19) with him. During this first visit to Europe Dahlberg had left his wife in Suriname. On 25 April 1761 he left Suriname for a second time, now accompanied by his wife and two children. They visited Holland and Sweden; in Stockholm their third child was born. The family returned in Suriname on 20 March 1765. On 11 May 1771 Dahlberg and his wife departed from Suriname for a third trip to Europe. They stayed in Amsterdam, where they were visited in December 1774 and January 1775 by the Swedish traveller J. J. Björnsthäl (see Björnsthäl, 1782, p. 229, footnote; 1783, pp. 408, 434, 448). They returned in Suriname 9 July 1775, and did not leave the country again. Dahlberg died in the afternoon of 6 September 1781 in Paramaribo. At that time he lived in the Heerenstraat, one of the mainstreets of the town, where he had rented a rather expensive house. His wife died 29 July 1803. Dahlberg was much interested in natural history and made extensive zoological and botanical collections, which, when visiting Sweden in 1754, he donated to King Adolf Fredrik. Also in 1762 he brought collections to Sweden, probably including the type material of *Cancer cordatus* which Linnaeus described in 1763; this material was donated to King Gustaf III and contained among other things 186 species of plants preserved in spirit. Dahlberg's zoological specimens that

found their way to the cabinet of King Gustav IV Adolf of Sweden (including the 1754 donation to King Adolf Fredrik) are at present preserved in the Zoological Institute of Uppsala University (see Holm, 1957, pp. 47, 49). Dahlberg also appears to have donated Suriname material to the Empress Catherina of Russia, who in 1763 presented these specimens to the St. Petersburg Museum (see Brandt, 1864, p. 12, and Penard, 1925, p. 153). When Dahlberg lived in Holland from 1771 to 1775 he evidently had a new collection of Suriname material, as Björnsthål, who in 1775 stayed with the Dahlbergs in Amsterdam, wrote (1783, p. 434): "Bij onzen waarden landsman, den heer overst-luitenant Dalberg... bezag ik zijne voortreffelijke verzameling van merkwaardige zaaken uit Amerika" (at the home of our worthy compatriote, lieutenant-colonel Dahlberg, I examined his excellent collection of curiosities from America). Dahlberg is far better known as a botanical than as a zoological collector; so Linnaeus devoted several papers to his plant collections (e.g., *Plantae Surinamenses*, 1775) and named the botanical genus *Dalbergia* for him. In pharmacology Dahlberg's name will always be connected with the introduction in Europe of the *Lignum Quassiae*, an antifebrine made from the wood of *Quassia amara* L. Dahlberg has become somewhat notorious because of a story which circulated about this maltreatment of a negro-slave named "Baron" (see Stedman, 1796, vol. 1, p. 84, vol. 2, p. 349). It was said that Dahlberg had educated Baron and promised him freedom, only to break this promise later by selling Baron as a slave to another person. Baron then should have refused to do any more work, and after having been publicly flogged for his obstinacy, escaped to the woods, where he soon became the leader of a group of negro-rebels. Baron was said to have vowed bloody revenge against Dahlberg. Dahlberg resented this story very much and went so far as to publish an official denial in the weekly "Surinaamsche Courant" of 25 October 1775 (see Oudschans Dentz, 1916). Much of the above information concerning Dahlberg is taken from the account by Sack (1911), who evidently made a thorough search of the Suriname archives for his most interesting study of the negro Quassie, the discoverer of *Quassia amara* L.; in Sack's paper three full pages are devoted exclusively to Dahlberg.

Daniel Rolander (born in Småland, Sweden, 1725, died Lund, Sweden, 1793) studied at the University of Uppsala and was a pupil of Linnaeus; he became the private tutor of Linnaeus's son. The fact that he "im Linnänschen Hause, seit Löfflings¹) Zeit, auferzogen war und sich ganz auf die Insektenkunde gelegt hatte" (Afzelius, 1826, pp. 57, 58), shows that Lin-

1) The botanist Löffling, also a pupil of Linnaeus, went to Spain in 1751 on Linnaeus's recommendation.

naeus must have had great confidence in him. During the ten years of his stay in Uppsala Rolander published several entomological papers. On Linnaeus's request he joined Dahlberg on his return voyage to Suriname in 1755. Rolander's trip was financed partly by Linnaeus, partly by the well known Swedish entomologist baron Carl de Geer. One of the instructions given by Linnaeus to Rolander was to try and send living specimens of the Cochineal insect to Sweden. On 21 October 1754 Rolander left Uppsala and went overland to Amsterdam, whence he and Dahlberg sailed for Suriname, arriving at Paramaribo 21 June 1755. During his stay in Suriname Rolander made many collecting trips in the neighbourhood of Paramaribo and also went up the Commewijne River. The unrest caused by the revolt of the escaped negro slaves prevented him from penetrating deeper into the interior of Suriname. He seems to have given most of his attention to Suriname botany, but he made also zoological collections. The climate did not agree too well with him and his health was undermined by fever, while furthermore his condition was made worse by the fact that according to the then prevailing custom in Suriname he had to drink more alcoholic beverages than he was used to in his home country. Later, because of his poor health, he could not find the strength to get rid of the drinking habit. After a stay of slightly more than half a year Rolander left Suriname on 22 January 1756 and sailed for the island of St. Eustatius (Netherlands Antilles), where he arrived on 23 February of the same year. He stayed 10 days at St. Eustatius, which he used for bringing together botanical collections. Via Amsterdam he reached Stockholm on 2 October 1756. Reportedly, Rolanders collections were very fine, while in his diary he had made many careful notes. How the Cochineal project went wrong was told by Afzelius (1826, p. 59): "Jun. 29 [1756]. Rolander auf der Heimreise von Surinam, schickte Cactus mit Cochenillen in einem Topfe. Aber Linnäus präsidirte, und der Gärtner nimmt die Pflanze heraus, putzt alle Unreinigkeit ab, folglich auch die Würmer, und setzt sie in einen andern Topf, so dass, obgleich die Würmer glücklich lebend ankamen, sie doch im Garten vergingen, ehe Linnäus sie zu sehn bekam. Folglich verschwand alle Hoffnung, diese Thierchen, von denen man glaubte, dass sie mit Vortheil in der Orangerie gezogen werden könnten, jemals zu erlangen. Dies griff ihn [Linnaeus] so an, dass er einen der schwersten Paroxysmen der Migraine erdulden musste". We do not know whether or not Rolander blamed Linnaeus for the loss of his Cochineal insects, but it is certain that the friendship between the two was ended when Rolander came back in Sweden: "Rolander, dieser undankbare Schüler, gab dem Linnäus nichts von allen seinen Sammlungen, im Gegentheil verläumdete er ihn allenthalben" (Afzelius, 1826, p. 59). Also Hornemann (1812, p. 16) re-

ported that Rolander kept most of his collections for himself during his stay in Sweden; he only gave some objects to assessor Bergius and sold part (or all?) of his insects to Baron de Geer. The plants collected by Rolander at St. Eustatius seem to have reached Linnæus by way of De Geer, since Linnæus wrote "Rolander sammelte auf den Inseln bei Amerika eine grosse Menge seltener Gewächse, die er an den Hofmarschall De Geer gab, und welche dieser an mich schenkte" (Afzelius, 1826, p. 230). After a stay of some years in Sweden Rolander went to Copenhagen. Here he sold his herbarium to professor Friis Rottböll and his Suriname diary to professor Kratzenstein, who in vain tried to get it published. Rolander's Suriname herbarium now forms part of the Copenhagen Herbarium. His diary, which bears the title "Diarium Surinamense, quod sub itinere exotico conscripsit Daniel Rolander" is kept as a manuscript in the Botanical Central Library at Copenhagen, and consists, as Mr. M. Skytte Christiansen was so kind to inform me, of a big volume in folio of about 700 pages closely written in latin. From Copenhagen Rolander went to Landskrona on the Swedish coast of the Sound, where general-major Strussenfeldt and a certain Mr. Schau took care of him. Strussenfeldt instructed him to make an inventory of the animals and plants of the island of Hveen in the Sound, but the list produced by Rolander was of very poor quality. After the death of Schau and the departure of Strussenfeldt, Rolander went to Lund, where he lived, ill and in greatest poverty, till his death in 1793. Most of the above data on Rolander are taken from Hornemann's (1812) biography of this naturalist.

Hendrik Haagen Dieperink (born Hoornaar, province of South-Holland, 10 April 1794, died Amsterdam, 18 May 1842) was the son of a Protestant minister and became about 1816 a military apothecary in Paramaribo. Between June 1824 and April 1836 Dieperink sent at least 13 consignments of preserved and living animals to the Rijksmuseum van Natuurlijke Historie at Leiden. Extensive lists of these consignments are still preserved in the archives of the Museum. In only two of them Crustacea are mentioned. Among the material sent on 24 May 1825 are listed: 4 specimens of the "waterkrab (zeeserika)" (= *Callinectes bocourti*), 3 "kreeften . . . Cancer Pennaceus" (= *Penaeus* sp.?), 2 "Garnalen Sarrasarras" (= *Xiphopenaeus kroyeri*?), 3 "postelijn krabben" (porcelain crabs, identity unknown), and 2 "duivelskrabben" (= *Uca maracoani*). The other consignment was sent 1 April 1827 and contained the following Crustacea: 2 "gewoone krappen, Cancer Cordatus" (= *Ucides cordatus*), 2 "zeekrappen Cancer an? depurator" (= *Callinectes bocourti*), 1 "moeraskrap, Cancer an. Uca?" (marsh crab, identity unknown), 4 "kleine krabbetjes . . . Cancer an. Vocans?" (= *Uca* spec.), 3 "vierkante krabben" (= *Goniopsis cruentata*), "een Surinaamsche

kreeft en onderscheidene Surinaamsche kreeftgarnalen" (a Suriname crayfish and several Suriname lobster-prawns; possibly *Macrobrachium carcinus* and *M. amazonicum*). Dieperink was a conscientious collector and tried to preserve his animals in the best possible condition. It is interesting to note his experiments for preserving the colour of crabs, mentioned by him when listing the above "vierkante krabben": "Tot bewaring van de kleur heb ik beproefd de spiritus met een mucilage G. arabicu te vermengen om daardoor de spiritus met die slijm verbonden zijnde, dezelve voor de oplossing van de kleur ongevoeliger te maken. — Het komt mij voor dat deze wijze bij eene nadere beproeving en bepaling van de hoeveelheid mucilage en spiritus en derzelve sterkte zeer wel boven alle andere hiertoe reeds beproefde middelen zal voldoen" (for the preservation of the colour I have tried to mix the spirit with a mucilage of gum-arabic, in order to make the spirit less capable of dissolving the colour. I believe that this method, when the correct quantities and strength of the mucilage and spirit have experimentally been determined, may be more satisfactory than the methods employed thus far). By way of experiment Dieperink had preserved two of the crabs in this mixture of spirit and gum-arabic and one in pure spirit. Dieperink's work on behalf of the Leiden Museum was much appreciated and on 26 January 1831 he received a golden medal from the government as a token of recognition for what he had done. C. J. Temminck, the director of the Leiden Museum, tried to persuade the Netherlands government to grant Dieperink the title of "Ridder in de Orde van de Nederlandsche Leeuw" (Companion of the Order of the Netherlands Lion) for the unselfish way in which he enriched the collections of the Museum. Evidently Temminck was successful, since in the announcement of Dieperink's death this title was annexed to his name. When in April 1836 Dieperink returned to Holland, his departure from Suriname was deeply regretted by Temminck, who wrote in a letter of 1 August 1836 to the Minister of Internal Affairs that it was a great loss to the Museum "dat zulk een ijverig verzamelaar het vruchtbaar oord zijner nuttige werkzaamheden heeft verlaten en tevens [ontstaat] de gegronde vrees, dat hij derwaarts niet zal wederkeeren en dus voor de belangen van het Museum, dat hem zooveel verplichtingen heeft, en waarvoor hij nog zoveel had kunnen verrigten, voortaan als verloren te achten is" (that such an industrious collector has left the fertile region of his useful occupations, while at the same time there exists the well founded fear that he will not return there and consequently must be considered lost for the interests of the Museum which owes him so much and for which he could have accomplished still more). As pointed out in paragraph II, De Haan and De Man made mention of some of Dieperink's Decapoda, but the collection as a whole has not been studied. At present only

a small portion of Dieperink's original Decapod collection is still in existence, most of the specimens having become lost in the century since their arrival in Leiden.

Constantin Hering (born Oschatz, Germany, 1 January 1800, died Philadelphia, U.S.A., 23 July 1880) studied medicine in Dresden, Leipzig, and Württemberg, Germany, and obtained his doctor's degree on 23 March 1826. After having been a teacher for a few months, at the end of 1826 or the beginning of 1827 Hering was sent by the government of Saxony to Suriname in order to collect natural history objects. On this trip he was accompanied by the botanist Weigel, who died rather soon after their arrival. Hering was one of the champions of the homeopathic method in medicine and practised this method in Suriname. An order by the king of Saxony telling Hering to leave medicine alone and to concentrate exclusively on the collection of natural history specimens, made Hering resign from his job with the Saxonian government. Now he settled as a physician in Suriname, where he stayed till the beginning of 1833, when he left for the U.S.A. to live in Philadelphia where he soon had a large practice. Till his death in 1880 Hering remained in Philadelphia but for two periods: (1) a brief stay at Allentown, Pa., where in 1835 he became the president of the short lived "North American Academy of the Homeopathic Healing Art", and (2) a seven year's stay (1845-1852) in Germany. Hering is generally considered the founder of American Homeopathy, and the Hering Institute of Chicago, founded in 1892, was named after him. When in Suriname, Hering at first did not have much success with the preservation of the material which he sent to Germany: "De Heer C. Hering is met de door ZijnEd. aan het Saxische Gouvt. toegezonden voorwerpen wat de conservatie betreft niet bijzonder gelukkig geslaagd" "Zeer veel schoone en zeldzaame voorwerpen zijn . . . bij den Saxische Naturalist C. Hering bedorven en geheel verloren gegaan" (letters, respectively of 20 April and 15 August 1828, written by Dieperink to Temminck, present in the archives of the Leiden Museum). There was a certain amount of rivalry between Dieperink and Hering as far as collecting of zoological specimens was concerned. Dieperink (in a letter of 15 September 1828 to H. Schlegel) complained that Hering, because of his activities as a doctor, was in a position to obtain specimens which were unavailable to others ("ofschoon ZijnEd. betrekking van Med. Doctor hem meermalen die belangrijke voorwerpen verschaft, welke men op geene andere wijze van deze of geene kan magtig worden"). Notwithstanding this slight rivalry, the relation between Dieperink and Hering seems to have been quite good: this not only appears from the fact that in 1831 and 1832 both served in a Committee for the study of the Cochineal (see Teenstra, 1835, pp. 307,

326), but also became evident, when once Dieperink had obtained a male specimen of a species of ray, while Hering received what he thought to be a female of the same species, Hering presented his specimen to Dieperink since "ZijnEdG. achtte het te belangrijk voor de Wetenschappen, dat deze twee zeldzaame ex. bijzondere visschen van elkander zouden gescheiden worden, en vond alzo goed, mij dezelve voor de medetoezending aan 's Rijksmuseum der Nederlanden aan te bieden. Welke edele Aanbieding door mij geenszins is van de hand geslagen" (he thought it too much in the interest of science not to separate these two rare specimens of curious fish, and therefore consented in giving me his specimen to have it sent to the Leiden Museum. This noble offer of course was not declined by me) (letter of 20 April 1828 by Dieperink to Temminck). We do not know whether Hering sent many Decapods to Saxony: the only Suriname material mentioned by Thallwitz (1892) in his list of the Decapoda of the Dresden Museum is *Pericera cornuta*, the collector of which is not mentioned. Of the utmost importance, however, is the Suriname Decapod collection sent by Hering to the Philadelphia Academy of Natural Sciences, where this material according to Fowler (1919, p. 129) was received about 1830. Randall published in 1840 on this material, describing four new species (see paragraph II, p. 13). Kingsley (1880, p. 202) mentioned a specimen from Hering's Suriname collection (*Planes minutus*), which had not been dealt with by Randall. Part of Hering's Crustacea are still preserved in the Philadelphia Museum; these are listed in the present paper. Hering's association with the Philadelphia Academy of Natural Sciences dates from as early as October 1826, when he was elected a correspondent of the Academy; when Hering settled in Philadelphia he became a member and was so till his death, which was announced in the meeting of the Academy of 27 July 1880 (Proc. Acad. nat. Sci. Phila., 1880, p. 330). A biographical sketch of Hering has been published by Oudschans Dentz (1930).

Jeffries Wyman (born Chelmsford, Mass., U.S.A., 11 August 1814, died Bethlehem, New Hampshire, U.S.A., 4 September 1874) graduated from Harvard College in 1833 and obtained his M.D. degree in 1837. In 1843 he became professor of anatomy and physiology at Hampden-Sidney College in Virginia, obtaining in 1837 a similar position at Harvard College. Apart from being a well known anatomist, he was the leading American anthropologist of his days. He made several trips within the U.S.A. and abroad (Labrador, S. America, Europe). In 1856 he visited Suriname with two of his pupils. Among his Suriname collections there are two specimens of a species of freshwater crab, which Rathbun (1905, p. 291) described as new and dedicated to Wyman by giving it the name *Pseudothelphusa wymani*. One of the

types is preserved in the Museum of Comparative Zoölogy at Harvard College, the other is in the U.S. National Museum, Washington, D.C. It is not known whether Wyman collected any other Decapoda during his stay in Suriname.

C. F. Kraepelin and H. Holm, who both were members of the board of the community of Moravian Brethern at Zeist, the Netherlands, around 1862 presented to the Rijksmuseum van Natuurlijke Historie at Leiden collections made by missionaries of the community in Labrador, Greenland, and the West Indies. Among this material there were four Crustacea which may have included the specimens of *Macrobrachium amazonicum* from Suriname mentioned in the present paper (p. 87). Later the Leiden Museum bought more material from Kraepelin and Holm, but no details as to the species contained in it are available.

Heinrich Benno Möscher (1831-1888), "Gutbesitzer am Kronförstchen bei Bautzen", Germany, did not collect in Suriname himself but received Suriname material "durch die Gefälligkeit zweier Freunde, welche in Surinam als Missionäre angestellt sind" (Möscher, 1878, p. 293). One of Möscher's collectors lived at a "Station, welche etwa 25 geographische Meilen im Innern gelegen ist" but was later transferred to Paramaribo where the other collector lived also. According to Horn & Kahle (1936, p. 180) Möscher sold insects, part of which reached the Berlin Museum. It is possible that the Berlin material of Suriname Decapoda was obtained from Möscher at the same time as the insects.

Christiaan Johannes Hering (born Paramaribo, 28 August 1829, died Paramaribo, 30 May 1907) was the son of Dr. Constantin Hering (see above, p. 23) by his first marriage (with Charlotte Kemper of Paramaribo). When Constantin Hering in 1833, after the death of his wife, left Suriname for the U.S.A., he entrusted the care of his son to his wife's relatives in Paramaribo. C. J. Hering joined his father one year later, when the latter had settled in Philadelphia. He went to school in the U.S.A. and Germany. In 1844, when his father went to Europe, C. J. Hering left the U.S.A. to visit his relatives in Suriname. He stayed there till 1848, when his father ordered him home to finish his studies. During his 1844-1848 stay in Suriname Hering, who had inherited his father's vivid interest in natural history, learned to mount animals and made natural history collections for a French Museum; in the same period he got a training which made him thoroughly acquainted with various aspects of Suriname agriculture. In Philadelphia he soon gave up his studies and in December 1849 we find him back in Suriname, where he occupied himself with various agricultural projects. In 1855 he made a visit to the United States in order to improve his knowledge of

tropical agriculture, returning the same year to Suriname. The Suriname government appointed him director of one of the government plantations, and when in 1863 all government plantations were sold, Hering acquired a private plantation. In 1872 he sold this plantation and accepted a government position in the Suriname Finance Department, from which he was pensioned in 1898. He lived for about 13 years in Coronie, afterwards, in 1900, returning to Paramaribo. Hering published several books and papers on tropical agriculture and on distillation, but he was also interested in archeology (he once made an expedition to the interior of Suriname for the investigation of old Indian inscriptions), meteorology, and natural history. Between 1882 and 1899 he sent several shipments of zoological specimens to the Leiden Museum. In September 1855 he was elected a non-resident member of the Philadelphia Academy of Sciences, which he presented on several occasions with natural history objects. In a letter dated Paramaribo 4 June 1883 and addressed to H. Schlegel, Hering wrote that since 1856 he was a correspondent of the Smithsonian Institution and that he had often sent collections of butterflies, etc., to their Museum. Oudschans Dentz (1930) published a biography of Hering.

Herman Frederik Carel ten Kate (born Amsterdam, 21 July 1858, died Carthage, Tunisia, 4 February 1931) was a well known ethnologist and anthropologist, who studied at the universities of Leiden, Paris, Berlin, and Heidelberg, obtaining his doctor's degree at the last-named university in 1882. Ten Kate travelled extensively in all parts of the world. He visited Suriname from 13 June 1885 to 19 February 1886, making extensive trips throughout the coastal region. He followed the Marowijne up to the Armina Falls and returned to Paramaribo via the Wane Creek and the Cottica River, collected zoological material in the region of the Upper Cottica River and Patamacca Creek, went up the Suriname River to Berg en Dal, explored the Upper Para region, followed the Saramacca River to Mariposton, spent some time in Coronie, and after going up the Coppename went via the Waijombo and Nickerie Rivers to the Corantijn River which he followed up to Oreala. Zoological collecting was done also in the neighbourhood of Paramaribo. An account of Ten Kate's stay in Suriname is given in *Tijdschr. Nederl. aardrijksk. Gen.*, ser. 2 vol. 3 (1886), pp. 92-97, 706-710. The zoological collections made in Suriname were donated by Ten Kate to the Rijksmuseum van Natuurlijke Historie at Leiden. De Man (1892) and Tesch (1917) dealt with Suriname crabs of this collection. An obituary notice of Ten Kate was published by Steinmetz (1931).

John H. Spitzly was an army surgeon with the Dutch forces at Paramaribo; during his stay in Suriname he collected zoological specimens (mostly insects,

but also vertebrates, parasitic worms and at least one crab). Several times between 1885 and 1892 the Rijksmuseum van Natuurlijke Historie at Leiden received material from him. Spitzly, notwithstanding his name which would suggest that his nationality was Swiss, seems to have been an Englishman; his letters are written in perfect English, and after leaving Suriname between 1892 and 1898 he settled in London. Between September 1898 and March 1900 Spitzly was repeatedly mentioned in the reports of the Leiden Museum as Mr. J. H. Spitzly of London. When in Suriname, Spitzly collected near Paramaribo and also near Berg en Dal on the Upper Suriname River. During his London period he sent material from Asia and Europe to the Leiden Museum. After 1900 no more mention of Spitzly is made in the reports and correspondence of the Leiden Museum.

Miss M. Koning collected zoological specimens near Paramaribo. In 1894 the Leiden Museum received material (insects, crustaceans, amphibians, and reptiles) from her; at that time her address was given as Paramaribo. In September 1900 an additional collection of Suriname insects was received; Miss Koning then lived in The Hague. I have not been able to obtain further particulars.

Of W. Gillespie hardly any data are known. His Suriname material of *Sesarma rectum* Randall was found unidentified in the collection of the Museum of University College of Dundee when this collection was transferred to the British Museum in 1955. Possibly Gillespie also collected the Suriname material which was mentioned by d'Arcy W. Thompson in his 1901 catalogue of the Crustacea of the Dundee Museum. However, no certainty can be obtained in this respect. In his paper, Thompson mentioned neither the *Sesarma* specimens nor did he cite Gillespie as a collector. Furthermore the Suriname material enumerated by Thompson seems to have become lost in the course of time and can no more be traced.

Julius Michaelis was a dealer of insects in Berlin. According to Horn & Kahle (1936, p. 176) he obtained Suriname material in 1898/1899. The Suriname Crustacea in the collections of the Berlin and Hamburg Museum marked Michaelis evidently formed part of this material.

D. G. J. Bolten (born The Hague, 5 April 1871) studied pharmacy at Leiden University (1893-1897). From 1 November 1898 to 31 May 1900 Bolten was curator of the Colonial Museum at Haarlem, and on 1 June 1900 he became a military apothecary. In this function he stayed in Suriname from 3 October 1902 to May 1910, returning afterwards to the Netherlands. He retired 1 June 1933. Bolten collected mainly insects, but also Crustacea were presented by him to the Leiden Museum. In a letter of 12 October 1921 he stated that he collected mostly "in de naaste omgeving van Para-

maribo (op vrije zondagen om de 14 dagen)" (in the close neighbourhood of Paramaribo on my Sundays off, every other week). Other localities where Boltzen made collections were the plantation "Belwaarde" on the Suriname River opposite Paramaribo, the plantation "Marienburg" on the southern bank of the Commewijne River, Albina on the Marowijne River, Groningen on the Saramacca River, and Maábo on the east bank of the upper Saramacca.

Pieter Buitendijk (born Leiden, 8 December 1870, died Leiden, 11 April 1932) studied medicine at Leiden University, starting his studies in September 1889. After having obtained his degree, Buitendijk became a ship's surgeon, making, between 1900 and the end of 1930, about four trips a year from Holland to the Netherlands East Indies and back. Usually these voyages took place via the Suez Canal, but because of World War I, the ships were rerouted around the Cape of Good Hope during 1916-1919; in 1917 and 1918 Buitendijk did not return to Holland but made voyages in the Pacific (China, Japan, Hawaii, San Francisco). Around 1901, in 1903, and in 1905 Buitendijk visited the West Indies. On practically all of his trips he made extensive collections, mainly of fishes and marine invertebrates, but also of many other groups; these collections were donated by him to the Rijksmuseum van Natuurlijke Historie. His West Indian material is insignificant as compared to the extremely rich collections from the East Indies; they contain only very few Suriname specimens. Buitendijk himself was especially interested in fishes, to the study of which he gave much of his time spent in Holland; the fact that he died rather soon after his retirement probably explains why he did not publish any zoological papers. He is the father of Alida M. Buitendijk, who from 1930 till her death in 1950 belonged to the staff of the Leiden Museum, in 1938 being entrusted with the care of the Crustacean collections.

Marius Dirk Horst (born Utrecht, 19 April 1879, died Leiden, 27 October 1958) was a son of Dr. Rutgerus Horst, who from 1882 till 1923 was curator of Invertebrates (exclusive of Insects and Molluscs) of the Rijksmuseum van Natuurlijke Historie at Leiden. M. D. Horst studied medicine at Leiden University, completing this study in 1905. He then became a ship's surgeon, and in this function made two voyages to the West Indies. On these trips, in 1907, he collected zoological material in Suriname, Venezuela, and Haiti, donating it to the Leiden Museum. His Suriname material, which consists of fishes and Crustacea, came from the neighbourhood of Paramaribo. After a few years as a doctor at a sanitarium in the Netherlands, Horst left for the East Indies in 1909 and stayed there till about 1915. From 1917 till 1920 he was lecturer in tropical medicine and assistant (later curator) at the Pathology Laboratory of Leiden University. 1 January 1921 he be-

came the director of the Medical and Health Department of the city of Leiden, a post which he occupied till his retirement in 1945. In November 1921 Horst obtained the doctor's degree at Leiden University. The crabs collected by Horst have been studied by Tesch, who in his 1917 paper dealt with the specimens of *Sesarma* of this collection.

C. Heller, who was of German nationality, was a missionary of the Lutheran Community of Moravian Brethern and between 1908 and 1910 was stationed in Suriname. Here he collected Crustacea in the Upper Saramacca River, near Paramaribo, in the mouth of the Suriname River, in the Para District, in the Upper Suriname River near Berg en Dal, in the Upper Commewijne River, and near Albina. His material was sold to the Zoological Museums of Berlin and Hamburg.

Jhr. Willem Cornelis van Heurn (born The Hague, 20 February 1887) studied biology at Leiden University finishing in 1923. From 29 May till 22 October 1911 Van Heurn visited Suriname, where he made extensive zoological collections for the Leiden Museum. Large series of marine and fresh water Crustacea were collected by him, mostly in the neighbourhood of Paramaribo, but also near Coronie, Groningen, Guyana Goud Placer, along the Commewijne, and near Albina. These collections are especially valuable because of the extensive series collected and of the careful way of preservation. In 1913, and from 1919 to 1939 Jhr. van Heurn stayed in the Netherlands East Indies (in 1913 as a member of an expedition to Simalur, from 1919 to 1932 as a zoologist of the Buitenzorg Institute of Plant Diseases, and from 1932 to 1939 as a biology teacher). He returned permanently to the Netherlands in 1939. Part of the Suriname Decapoda collected by Van Heurn have been reported upon by Tesch (1917) and Holthuis (1948, 1950a, 1952).

Assueer Jacob Baron Schimmelpenninck van der Oye (born Nijkerk, 17 February 1872, died Lochem, 26 July 1945), correspondent of the Netherlands Bank, was the son of Assueer Jacob Baron Schimmelpenninck van der Oye (born The Hague, 13 April 1835, died Paramaribo, 21 August 1915), who after having been burgomaster of the Netherlands town of Nijkerk, became administrator of the Finance Department of Suriname. Between October 1913 and March 1914 several lots of molluscs collected in Suriname were received by the Rijksmuseum van Natuurlijke Historie at Leiden as a gift from either the elder or the younger Schimmelpenninck van der Oye. Among these shells one hermit crab from near Paramaribo was found.

Adriaan Reyne (see under paragraph II, p. 16), in 1922 collected *Macrobrachium jelskii* in trenches of the Experimental Garden of the Department of Agriculture in Suriname. The specimens were sent for identification to

the U.S. National Museum, Washington, D.C., where they are still preserved. Both Reyne (1923) and Holthuis (1950a, 1952) reported upon this material. In the spring of 1920 Reyne made a trip to the Avanavero Falls in the Kabalebo River (Corantijn basin), where crabs were collected.

Ivan Terence Sanderson (born Edinburgh, Scotland, 30 January 1911) obtained his B. A. degree at Cambridge University in 1931. Between 1927 and 1940 he undertook one round-the-world trip (zoological collecting in Indonesia), and six scientific expeditions (one to West Africa, the others to the West Indies, Central and South America) during which zoological material was collected for the British Museum and other institutions. The third of these scientific expeditions, which was undertaken on behalf of the British Museum, was to Suriname; the personnel consisted of Sanderson himself, his wife and an assistant. The party stayed in Suriname from the beginning of January to December 1938. After spending about a month in Paramaribo making preparations for trips into the interior, the expedition went up the Coppename River by small motor launch to near Kaaimanston, where it stayed several months. After its return to Paramaribo the expedition almost immediately started a trip up the Para River and Coropina Creek to Zanderij. The next trip was to the region of Donderberg where some months were spent at the abandoned site of the Van Emden mining company at about six miles east of the railroad at 91.5 km S. of Paramaribo. Crustacea were collected near Paramaribo, near Kaaimanston, and near Donderberg. After having served in World War II, Sanderson entered the British Ministry of Information and later the British Foreign Office. In 1947 he organized his own business in New York — Ivan Sanderson Inc. — for "Natural History in its widest sense". Sanderson is well known to the general public for his popular and juvenile books, his articles in various magazines, and for his radio and television series. His book "Caribbean Treasure", describing his Suriname expedition, proved a best seller and is now published in nine languages. Sanderson also published scientific papers, e.g., on the mammals of Suriname.

Hermanus Willem Christiaan Cossee (born Leiden, 29 May 1914), who since 15 March 1935 is a technician in the division of birds of the Rijksmuseum van Natuurlijke Historie at Leiden, visited Suriname from 26 February till 9 April 1939. He collected zoological material for the Leiden Museum, mainly in the neighbourhood of Paramaribo. Some of the *Macrura* collected by Cossee have been mentioned by Holthuis (1952).

Lodewijk Juliaan Schmidt (born Gansee, Suriname, 1 May 1898) took part, usually as a foreman, in several expeditions to the southern border region of Suriname, namely in three expeditions under vice-admiral C. C.

Käyser (1935-1937), in one under Father G. W. M. Ahlbrinck to the Oelemarie in 1938, and in one under Dr. D. C. Geijskes to the Litani in 1939. Furthermore he went three times (1940, 1941, 1942) by himself to this region for a census of the Oajana and Trio Indians (see Schmidt & Stahel, 1942), and accompanied Dr. Geijskes in 1943-1944 on his trip to the Upper Coppename. Schmidt also took part as a foreman in the 1948-1949 Suriname Expedition. In 1949 he entered the Suriname Forest Service and in 1954 was appointed superintendant of the local government in the Suriname River district. Schmidt collected Crustacea near the Tafel Mt., and at various localities on the Upper Suriname River (Mamadam, Gingré Soela, and Bakra Oposton).

Antoine Maria Hubert Hermans (born Brunssum, the Netherlands, 2 March 1907) studied at the Polytechnical College of Delft, the Netherlands, where he obtained his degree of mining engineer. In 1937 Hermans went to Suriname in the service of the Sara Creek Mining Co. of which he is now the head. This company, after having worked first at the Sara Creek, a branch of the Suriname River, has now moved its activities to the Lawa River (Upper Marowijne basin) near Benzdorp. The Rijksmuseum van Natuurlijke Historie possesses Decapod material collected by Hermans in the Sara Creek.

Dirk Cornelis Geijskes (born Kats, province of Zeeland, 16 May 1907) studied biology at Leiden University and obtained his doctor's degree at the University of Basel, Switzerland, in 1935. He was appointed entomologist of the Agricultural Experiment Station of Suriname, and arrived in Paramaribo March 1938. In 1952 Geijskes became Government Biologist of Suriname, a post which he occupied till 1954 when he was appointed Director of the Surinaams Museum in Paramaribo. Crustacean material was collected by Geijskes on experimental fishing trips off the Suriname coast, in many localities in the coastal area of the country (Nickerie, mouth of the Suriname River, region of Paramaribo, many localities between Paramaribo and Kabel, mouth of the Warappa Creek), and during numerous expeditions into the interior of Suriname: to the upper reaches of the Litani River, June-September 1939 (cf. Geijskes, 1942, 1957), to the region of the Upper Coppename River, 5 July 1943-20 January 1944 (cf. Geijskes, 1946), various trips up the Marowijne and Tapanahoni Rivers and to the southern border region (1952, 1953, 1954), to the upper reaches of the Coppename River, 1957, and to the Tafel Mt., 1958. Furthermore Geijskes was the leader of the 1948-1949 Suriname Expedition (see p. 39) and of the 1952 Medical Expedition (see p. 40). Special attention was given by Dr. Geijskes to economically important species, but other forms also were intensively collected by him.

Though Dr. Geijskes's main interest is with the insects (he himself is a specialist of the Odonata), his Crustacean collections are considerable and form by far the larger part of the Suriname material on which the present paper is based, apart from the "Coquette" collection. All Dr. Geijskes's material is preserved in the Leiden Museum, duplicates are in the Surinaams Museum.

François Haverschmidt (born Utrecht, 21 June 1906) studied law at Utrecht University. After obtaining his degree Haverschmidt obtained a position with the Dutch courts of justice. In 1946 he went to Suriname where he first became a member, later the president of the court of justice. When still in the Netherlands, Haverschmidt was one of the foremost ornithologists of the country and at present he is the best authority on Suriname birds. Remains of Decapoda found in the stomach contents of Suriname birds were sent by Haverschmidt to the Rijksmuseum van Natuurlijke Historie for identification.

Jan Christiaan Lindeman (born Zutphen, 26 June 1921) studied biology at Utrecht University (1940-1948), obtaining there his doctor's degree 19 January 1953. Since 1946 he is a member of the staff of the University Institute of Systematic Botany in Utrecht. He took part as a botanist in the 1948-1949 Suriname Expedition, and from March 1953 to March 1955 made a second visit to Suriname. During this second stay in Suriname he occupied himself with forest research and worked mainly in the region between Joden-savanne and the Mapane Creek, but also in the region W. of the mouth of the Coppename River, at the confluence of the Coppename and Waijombo Rivers, at the Upper Coppename River near Bitagron, at the Jandé Creek in the Upper Suriname River basin below Kabel, in the region of Moengo, and in the Nassau Range. Crustacea were collected by Lindeman W. of the Coppename mouth and near Suhoza on the Upper Suriname River.

Christiaan Bleys (born 's-Hertogenbosch, 23 December 1918) studied geology at Utrecht University, and from 9 April 1949 to 20 April 1954 was a field geologist with the Service of Geology and Mining in Suriname. Afterwards he left for Australia, where he obtained a position as geologist. In Suriname Bleys collected Crustacea in the bush creeks flowing down the Browns Mt. near the railway about 121 km S. of Paramaribo.

Robert Marie Joseph Wirtz (born Paramaribo, 25 March 1921) was a technician of the Fisheries Service in Suriname from 9 May 1949 until 1 June 1954; he collected Decapod Crustacea which were sent for identification to the Leiden Museum. Later Wirtz left Suriname for Canada.

E. C. Stoll is a dealer of living animals in Leiden, who specializes in tropical fish. At several occasions Stoll presented fish material to the Leiden

Museum, and once provided living specimens of *Palaemonetes carteri* from Suriname.

Conrad Friederich Albert Bruijning (born Paramaribo, 10 November 1919) studied biology at Leiden University, obtaining his doctor's degree in 1948. After having been a biology teacher in a secondary school at Haarlem, Holland, he was appointed 1 October 1949 government biologist of the Medical Service in Suriname, where he stayed until 1955, when he accepted a position as curator of Entomology at the Leiden Museum. 1 January 1959 he was appointed curator at the Institute of Tropical Hygiene in Leiden. During his stay in Suriname Dr. Bruijning made several trips into the interior of the country, he took part in the 1952 Medical Expedition to the border region, and collected material near Paramaribo. This material is now incorporated in the Leiden Museum.

J. H. C. B. Heyde (born Paramaribo, 5 May 1921) in 1949 was appointed assistant of the Information Service of the Department of Agriculture of Suriname, and 1 July 1950 became chief assistant of the Entomology department of the Agricultural Experiment Station of Suriname, a position which he occupied till 1 March 1953. In this function Heyde made collections, among other things of Crustacea from the Suriname River, which were sent for identification to the Leiden Museum. At present Heyde is occupied with the export of living animals.

Hendrikus Wilhelmus Lijding (born Den Helder, 31 December 1903), after finishing the school of navigation served from 1923 to 1937 as a chief mate in the Dutch merchant navy. From 1932 to 1934 and from 1937 to 1941 Lijding was the head of a fisheries company in the Netherlands East Indies. After the Japanese capitulation he became attached to the Fishery Service of East Indonesia, which he left in 1951. After having occupied himself in 1951 and 1952 with fishery problems in Netherlands New Guinea, on 1 January 1953 he was appointed Adviser for Fishery Affairs in Suriname and on 1 January 1955 became the Head of the Suriname Fisheries Service. Mr. Lijding, being much interested in the Suriname prawn fishery, repeatedly collected samples, which were sent for identification to the Leiden Museum; also other Decapods were collected by him.

Pieter Wagenaar Hummelinck (born Vlaardingen, 13 January 1907) studied biology at Utrecht University, obtaining there his doctor's degree on 8 July 1940. 1 January 1942 he became assistant at the section Parasitology of the Veterinary Faculty of Utrecht University. Since 1 January 1946 Hummelinck is curator at the Zoological Laboratory of Utrecht University. As a member of the board of WOSUNA (Foundation for scientific research of Suriname and the Netherlands Antilles) and as secretary of the "Natuur-

wetenschappelijke Studiekring voor Suriname en de Nederlandse Antillen" (Society for the study of the natural history of Suriname and the Netherlands Antilles), Hummelinck is the central figure for all matter concerning the study of zoology of the Netherlands Antilles. He made four collecting trips to the West Indies (April-December 1930; May 1936-April 1937; July 1948-September 1949; December 1954-September 1955). He visited Suriname during the last three of these trips: 2 and 3 May 1936 (collecting near Paramaribo, cf. Hummelinck, 1940, p. 20), 2 and 3 August 1948 (collecting near Paramaribo and Zanderij, cf. Hummelinck, 1953, pp. 20, 49), and 1-3 September 1955 (collecting near Republiek and Kabel).

Johannes van der Kamp (born Bussum, 4 July 1936) is a preparator and photographer of the Zoological Museum at Amsterdam. As part of his military service Van der Kamp stayed as a soldier in Suriname (February 1956 to March 1957), while in his spare time he collected mammals, amphibians, reptiles, fishes, and shrimps. Most of this material was obtained near Zanderij, a small part being collected near Paramaribo; it is now preserved in the Amsterdam Museum.

Lipke Bijdeley Holthuis (born Probolinggo, East Java, 21 April 1921) studied biology at Leiden University, obtaining his doctor's degree on 23 January 1946. 1 August 1942 he was appointed assistant curator at the Rijksmuseum van Natuurlijke Historie at Leiden, he became a curator on 1 August 1947. As an extension of a half year's trip to the Netherlands Antilles he visited Suriname from 29 March to 13 April 1957 and made collections in and near Paramaribo, in various localities between Paramaribo and Kabel, in Coronie, in localities between Paramaribo and the mouth of the Coppename River, at the mouth of the Suriname River, and in the district Commewijne near the Fisheries Service Station "Matappica".

Anton Cornelis Jacobus Burgers (born Arnhem, 21 August 1925) studied biology at Utrecht University, obtaining his doctor's degree on 9 July 1956. Dr. Burgers, who is attached to the staff of the department of endocrinology of the Zoological Laboratory of Utrecht University, in 1956 and 1957 visited the Netherlands Antilles and Suriname with the main object of studying the eyestalk hormones of Crustacea (especially of the genus *Uca*). Part of the material used for these experiments was preserved and sent for identification to the Leiden Museum, where it now forms part of the collections. Suriname was visited by Dr. Burgers from 7 August to 4 September 1957; during this period crabs were collected at the mouth of the Matappica Canal (15-30 August 1957) and near Christiaankondre at the mouth of the Marowijne River (the end of August 1957).

V. Expeditions. In the present century several expeditions were sent out

to the interior of Suriname with the object to increase our knowledge of the geography, the population, the geology, and the natural history of that region. Though in most of these expeditions the collecting of natural history objects was considered to be of secondary importance, we owe a great deal of information on the animal and plant life of the interior to these exploration trips.

1900 Nickerie Expedition. Personnel: Dr. H. van Capelle, lecturer of the State Agricultural School, Wageningen, Netherlands (leader; zoology, geology, tree flora), Dr. J. E. Tulleken, pharmacist (botany), H. van Capelle, Jr. (meteorology, photography), Mr. C. van Drimmelen, commissioner of the Nickerie District, Mr. J. Haenen (geography), Mr. J. C. Ganzert (geography). The expedition started from Nieuw-Nickerie and went up the Nickerie River by boat to somewhat above the Van Eeden Falls, at about $4^{\circ} 42' N$ (3-24 September 1900). Then it returned, following the Nickerie down to the mouth of the Fallawatra River (25 September-2 October), which was explored first by boat and then overland along a tracé which ran more or less parallel to the river, crossed it several times, and ended at about $4^{\circ} 45' N$ (2-18 October). When returning, the mouth of the Fallawatra River was reached on 22 October and Nieuw Nickerie on 2 November. Narratives: Van Capelle, 1903, 1905.

1901 Coppename Expedition. Personnel: Major L. A. Bakhuis, former officer of the Topographic Service of the Netherlands East Indies (leader; geography), lieut. A. J. van Stockum (geography), the medical officer H. A. Boon (physician; zoology, botany), Mr. W. L. Loth, government land surveyor (geography). The expedition left Paramaribo by boat 5 August 1901, arriving at the mouth of the Coppename River 6 August. This river was followed up by boat to the confluence of the Linker and Rechter Coppename Rivers (6 August-19 September); on the way up longer stops were made at the Raleigh Falls (12-28 August), the Langadansoela Falls (31 August-7 September), the Sidonkroetoe Falls (8-13 September), and the Tonckens Falls (14-19 September). Thereupon the Linker Coppename River was followed up to about $4^{\circ} 10' N$ (19 September-3 October). Here the larger part of the company returned, only Van Stockum went on to about $4^{\circ} N$ (3-7 October). The main body of the expedition reached the confluence of the Linker and Rechter Coppename Rivers on 4 October. Mr. Boon then went to the Tonckens Falls camp (4-17 October), Bakhuis and Loth explored the Rechter Coppename to about $4^{\circ} N$ (4-9 October), returning along the same way to the Tonckens Falls (9-11 October), where Van Stockum had arrived 9 October. The latter stayed here till 13 November. The main party went home down the Coppename River (17 October-1 November), from

21 to 24 October staying near the Raleigh Falls and exploring the Tanjimama River. This group returned in Paramaribo on 3 November, Mr. van Stockum arriving there on 28 November. Narrative: Bakhuis, 1902.

1902-1903 Saramacca Expedition. Personnel: Lieut. A. J. van Stockum (leader; geography, geology), Mr. P. J. de Kock, medical officer of the Netherlands Navy (physician; zoology), Dr. A. Pulle, assistant of the Botanical Department, Utrecht University (botany), Mr. J. W. van Gelder. The expedition left Paramaribo by boat on 31 October 1902, reaching the Saramacca River the next day via the Saramacca Canal. It went up the Saramacca River to Post Mindreneti (1-5 November). Mr. van Stockum with a small party continued the trip up the Saramacca and Toekoemoetoe Rivers to about $4^{\circ} 5' N$ (8 November-14 January), returning to the mouth of the Ietie Creek at about $4^{\circ} 8' N$ (14-15 January 1903); on the way up they stayed slightly over one month near Jan Basi Gado Mt. (23 November-1 January). From 15 January to 3 February this group went overland to the Hendrik Mt. and returned along the same way (3-25 February), arriving 26 February at the confluence of the Saramacca and Toekoemoetoe Rivers. The other party, including both the zoologist and the botanist, stayed longer at Post Mindreneti and arrived 16 December at the camp near Jan Basi Gado Mt. They left this camp after 1st January, arriving at the mouth of the Toekoemoetoe River before Mr. van Stockum returned there. From this camp the expedition went up the Saramacca River to near De Kock Mt. at about $3^{\circ} 47' N$ (5-17 March), and stayed there till 24 March when the return trip down the Saramacca was undertaken. Dr. Pulle went on directly to Paramaribo, the rest of the party stayed some time (30 March-20 April) at about $4^{\circ} 20' N$ near Mombabasoe, undertaking from there an overland trip to Ebba Mt. The return trip began on 21 April and Paramaribo was reached on 27 April. Narratives: Van Stockum, 1904, 1905.

1903-1904 Gonini Expedition. Personnel: Lieut. A. Franssen Herderschee, officer of the topographical service of the Netherlands East Indian Army (leader; geography), Lieut. C. H. de Goeje (geography), Mr. G. M. Versteeg (physician; botany, zoology), Mr. H. van Breen, district commissioner, Mr. B. von Faber, mining engineer (geology). The expedition left Paramaribo on 28 July 1903 by boat, arriving the next day at the mouth of the Marowijne River, and reaching the mouth of the Gonini River on 10 August. Here, on 13 August, the expedition was split into two parties. One, led by De Goeje, went down the Lawa River and then up the Tapanahoni River to near the Manlobbi Range, which then was climbed for surveying purposes. On 24 August the leader left the second party and joined the first the next day; on 5 September the first party left the Tapanahoni River and on 8 September

met the second party, which had gone up the Gonini River to the Gransoela Falls. The zoologist had stayed most of the time with the second party, leaving it only around 4 September to meet the first group. The complete expedition went up the Gonini to the confluence of the Wilhelmina and Emma Rivers (9-12 September). Here again two parties were formed. One, with the leader and Van Breen, went up the Emma River to about $3^{\circ} 25' N$ (16-26 September), returning at the mouth of the river on 1 October. The second party (with De Goeje and Versteeg) went up the Wilhelmina River to about $3^{\circ} 28' N$ (16-24 September) and then returned (25 September-3 October). The zoologist became ill and stayed behind on 21 September, being picked up by his party on their return trip. The main body of the expedition stayed at the confluence camp till 11 October, only a small party under De Goeje left 5 October for Cottica on the Lawa River. The others went down to the Gransoela Falls (11 and 12 October) and stayed there till 16 October. Thereupon they went to Cottica (16-24 October) and stayed there till 10 November; in this period overland trips to the Cottica Range in French Guiana were made. On 10 November the expedition went up the Lawa River to the mouth of the Litani River (10-20 November); Van Breen left the expedition on 13 November to return via Albina (1 December) to Paramaribo. The rest followed the Litani River to close to the Brazilian border (20-30 November). Here the region of Knopaiamoi Mt. was explored (30 November-15 December). The return trip went down the Litani (16-24 December), the Lawa (25 December-2 January), and Marowijne Rivers. Via Albina (6 January 1904) Paramaribo was reached on 8 January. Mr. von Faber's trip coincided only occasionally with that of the main part of the expedition; he left Paramaribo much later, concentrated on the Gonini and Emma Rivers (August-November) and returned to Paramaribo with Van Breen. Narrative: A. Franssen Herderschee, 1905.

1910-1911 Corantijn Expedition. Personnel: Lieut. J. G. W. J. Eilerts de Haan (leader till his death on 29 August 1910; geography), Lieut. C. C. Käyser (leader after the death of Eilerts de Haan; geography), Mr. J. F. Hulk, medical officer of the Netherlands Navy (physician; botany, zoology). The expedition left Paramaribo on 19 July 1910 by train for Kabel, from where, on 23 July, it went up the Suriname River by boat, reaching Goddo at the confluence of the Gran Rio and Pikien Rio on 2 August. The Gran Rio was then followed up to about $3^{\circ} 26' N$ (6-24 August). From here an overland trip of about 24 km was made to the upper reaches of the Lucie River. Several circumstances, e.g., the death of the leader, caused that the trip down the Lucie River did not start until 12 October. Most of the zoological collections were made in the period 24 August-12 October. The Lucie

River was followed down (12 and 13 October) and from the point then reached, at about $56^{\circ} 30' W$, several overland and river trips were made to explore some mountains on the right bank (13 to 21 October). On 23 October a point on the Lucie River at about $56^{\circ} 40' W$ was reached. The mountains on the left bank were explored here (23 October-14 November). On 18 November a camp was made at about 30 km from the mouth of the Lucie River at about $57^{\circ} 24' W$ (18 November-7 December), and from 9 to 18 December the expedition stayed at a camp still closer to the mouth of the river. The Corantijn River was reached on 19 December and followed up to the mouth of the Sipaliwini River (21 December-9 January); the expedition then went up this river as far as about $56^{\circ} 16' W$ (9-18 January). Now an overland trip of about 40 km was undertaken in a N.E. direction (18 January-3 February). Returning on 7 February, the Sipaliwini was reached on 9 February, and the mouth of the Lucie River on 22 February. From here the expedition went down the Corantijn River to the mouth of the Kabalebo River (25 February-15 March), which was followed up to about $57^{\circ} 10' W$ (15-23 March). The Corantijn was reached again on 29 March and followed to the mouth, the expedition entering Nieuw-Nickerie on 1 April 1911. Narratives: Käyser, 1912; Hulk, 1911.

1922 Expedition to Hendrik Mt. Personnel: Dr. G. Stahel, director of the Agricultural Experiment Station at Paramaribo (leader), Mr. J. W. Gonggrijp, government forest service officer. The expedition left Paramaribo on 10 February 1922, going up the Saramacca River to explore Hendrik Mt. (1080 m alt.) in the Emma Range. The main interest of the expedition was botanical, but a number of zoological specimens were collected.

1926 Expedition to the Wilhelmina Range. Personnel: Dr. G. Stahel, director of the Agricultural Experiment Station at Paramaribo (leader; botany, meteorology), Dr. R. IJzerman (geology), Dr. D. S. Fernandes, phytopathologist of the Suriname Agriculture Department (zoology), Mr. H. C. van Ommeren (physician), Col. J. Kremer (geography), Mr. H. Kuiperbak (geography), Mr. G. W. M. Ahlbrinck (ethnology). From the beginning the expedition was split into two parties. On 5 January 1926 the first party with Drs. Stahel, IJzerman and Mr. van Ommeren went by train to Kabel and from there by boat up the Suriname River, reaching Goddo near the confluence of the Gran Rio and Pikien Rio on 16 January. The Gran Rio then was followed to about $3^{\circ} 24' N$ (IJzerman: 30 January-10 February; Stahel and Van Ommeren: 8-28 February). From here the expedition went overland to the Lucie River (IJzerman: 10 February- 8 April; Stahel and Van Ommeren: 28 February-19 April). The Lucie River was followed down to about $56^{\circ} 30' W$ (IJzerman: 8-10 April; Stahel and Van

Ommeren: 19-22 April). Several trips, mostly overland, but partly by boat, were made to explore the Wilhelmina Range and the Tafel Mt. (10 and 22 April to 9 August). Afterwards the Lucie River was followed down to its mouth (9-18 August). The Corantijn and New Rivers were then explored up to $3^{\circ} 7' N$ (22 August-4 September). Thereupon the party went up the Coeroeni River and back to the New River (4-10 September). On 19 September Mr. van Ommeren left the expedition to return to Paramaribo, the others went again up the Coeroeni and Koetari Rivers to somewhat N. of $2^{\circ} N$ (19 September-18 October), returning at the mouth of the Lucie River on 5 November. From here the Corantijn River was followed to its mouth (6-20 November) and Paramaribo was reached on 24 November. The second party with Col. Kremer and Dr. Fernandes started from the mouth of the Corantijn River, leaving Nieuw-Nickerie on 20 April 1926 and arriving at the mouth of the Lucie River on 7 June. A camp was made on the shore of the Lucie River at about $57^{\circ} 25' W$ (2-9 July). On 10 July col. Kremer went up the Lucie River and joined the main party; he explored the Wilhelmina Range from 27 July to 2 September, and on 6 September, after an overland crossing from the Lucie to the Coeroeni River, joined the main party at the latter river. On 19 September Kremer and Van Ommeren left the rest of the expedition, and arrived on 6 October in Nieuw-Nickerie. On 11 July Dr. Fernandes left the camp at the Lucie River at $57^{\circ} 25' W$ and went overland in a N.E. direction for about 43.5 km (11 July-8 August). He returned at the Lucie River on 16 August. Going down the Lucie River he joined the main body of the expedition on the same day. On 28 August he left the expedition, arriving on 11 September in Nieuw-Nickerie. The ethnologist, Ahlbrinck, left Nieuw-Nickerie on 10 August 1926, joining the main body of the expedition at the mouth of the New River on 16 September. He took part in the trip up the Coeroeni and Koetari Rivers, leaving the rest of the party on 21 October to explore the Aramatau River (25 October-8 November). On his return trip the Kamani River was explored (17-19 November), and longer stops were made at the Frederik Willem IV Falls (1-8 December) and the Wonotobo Falls (16-22 December). Nieuw-Nickerie was reached by Ahlbrinck on 29 December. Narratives: Stahel, 1926-1927; Ahlbrinck, 1929.

1948-1949 Suriname Expedition. Personnel: Dr. D. C. Geijskes, entomologist of the Agricultural Experiment Station, Paramaribo (leader; zoology), Mr. P. H. Creutzberg (zoology), Dr. J. Lanjouw, professor of botany, Utrecht University (botany), Mr. J. C. Lindeman (botany), Dr. J. P. Bakker, professor of physical geography, Amsterdam University (geomorphology, geology), Dr. A. Brouwer, curator, Geological Museum, Leiden

(geology). The expedition explored four tracé's in the coastal region and in the anterior foothills:

1. From the middle of September to the end of October the expedition went due north from Moengotapoe (N.E. Suriname) till further progress was made impossible by the large Third Swamp. Then they started from the other end of the intended tracé, namely from the sea shore near the Wiawia Bank due south till the Third Swamp was again reached (10 November to the beginning of December 1948).

2. At 21.6 km E. of Coronie a north-south tracé, extending from the sea shore 5.5 km southward, was explored. This tracé crossed the highway from Coronie to Paramaribo at about 3 km from the sea (9-23 December 1948).

3. The savanne region near the Tibiti River, a right hand branch of the Coppename River, was explored from 3 to 20 January 1949.

4. A tracé with a length of about 20 km was made, extending due west from a point on the Marowijne River at $4^{\circ} 47' N$. This tracé penetrated into the Nassau Range at about 100 km S. of Albina (3 February-1 April 1949).

Furthermore material was collected by the expedition in the beginning of September near Republiek, and in the middle of September and in October in the mouth of the Marowijne River (when it went to and came from Moengotapoe). In January 1949 collections were made in the Suriname River near "Peperpot" plantation by Mr. Creutzberg, who on account of illness could not attend the third project of the expedition. The actual expedition over, some material was collected near Paramaribo. Narrative: Bakker and Lanjouw, 1949.

1952 Medical Expedition to the southern border region. Personnel: Dr. D. C. Geijskes (leader; zoology), Dr. C. F. A. Bruijning (zoology), Dr. V. de Munck (geology), Mr. J. W. Brinck (geology), Mr. J. D. G. Schaad (physician), Mr. M. G. Malmberg (physician). On 11 February 1952 the expedition started from Paramaribo for Albina, where a couple of days were spent, leaving on 17 February. The Marowijne and Tapanahoni Rivers were followed up by boat and on 1 March Drietabbetje on the Tapanahoni River was reached. The expedition stayed here till 7 March, when it went up the Tapanahoni River, reaching the mouth of the Paloemeu River on 19 March. This river was then followed up almost to its source, the end camp near the village of Apisiké on the upper Paru River in Brazilian territory being made on 7 April. From this camp a trip on foot was made farther into Brazil (10-17 April). A camp was then made on the upper West Paru River, Brazil (23 April), and on 25 April Alinsoekondre was reached. From here Geijskes and De Munck went to the upper Sipaliwini River (Corantijn

basin) (28 April), while Brinck explored the Paru savannah (30 April). Between 8 and 10 May the members of the expedition met again in a camp on the upper Tapanahoni River (Tapanahoni). From here the expedition went down the Tapanahoni River (12 May), reaching Drietabbetje on 5 June; at several villages on the way down some days were spent. On 8 June Geijskes left Drietabbetje for Albina and Paramaribo, while Bruijning arrived much later (27 June) in Albina.

1957 "Coquette" Investigations. The American trawler "Coquette" (owner Mr. Henry B. Lee of Miami, Florida) was hired by the government of Suriname to explore the sea off the Suriname coast. The main object of these investigations was to ascertain whether this area provides enough shrimp and fish to make an offshore fishery economically possible. Apart from noting the amount of shrimp taken at each haul, samples of fish and marine invertebrates were collected for purposes of scientific research. On the first six voyages (1-5 April, 8-12 April, 15-20 April, 23-27 April, 29 April-3 May, and 6-9 May, respectively) this collecting was done by Mr. H. W. Lijding, Dr. D. C. Geijskes, or employees of the Suriname Fisheries Service; the localities, though quite accurately given, were not indicated in degrees latitude and longitude. On the 7th and later trips the collecting of scientific material was done by Mr. James B. Higman of the U.S. Fish & Wildlife Service, who for this purpose had come over from the U.S.A. From this moment the localities were given station numbers and of each the exact position was noted. These stations range from 1 (11 May 1957) to 453 (31 July 1957); later, in August, a few more samples were taken by the "Coquette". The area investigated by the "Coquette" extends from the mouth of the Nickerie River eastward to about Ile de Salut in French Guiana. Practically all the samples were taken between 20 and 30 miles offshore. The material collected by the "Coquette" has been divided among the Leiden and Washington Museums. After the completion of the above project the Suriname government took over the "Coquette", which is now used by the Suriname Fisheries Service.

C. OCCURRENCE OF DECAPODA IN SURINAME

Suriname may roughly be divided into three regions each of which possessing a more or less homogeneous Decapod fauna:

a. The interior region, which extends from the Suriname-Brazil border northward to the foothills of the Suriname mountains; the northern limit of this region is indicated by the line connecting the northernmost falls of the larger rivers. The interior region contains numerous larger or smaller streams, the larger flow roughly from south to north. In the area under

consideration the water of the rivers is not subject to the influence of the tides, it is clear and perfectly fresh. In most instances the river bottom is rocky, while there are numerous rapids and falls (pl. I fig. 1). The Decapoda found in this region are (1) typical freshwater prawns belonging to the genus *Macrobrachium*, and (2) freshwater crabs of the family Potamonidae. Three species of *Macrobrachium* have thus far been found in the interior region: *M. brasiliense*, *M. olfersii*, and *M. carcinus*. *M. carcinus*, and in rare instances also *M. brasiliense*, are also found in the coastal region. Of the Potamonids *Potamocarcinus latifrons* is a characteristic species of the interior region: its known range, namely, coincides exactly with the interior region as defined above. The three species of *Pseudothelphusa* known from Suriname are either restricted to the interior region or extend their areas slightly into the extreme southern part of the coastal region. The three species of *Trichodactylus* inhabit the interior as well as the coastal regions, apparently being more abundant in the latter. Some of the freshwater crabs sometimes are found out of the water in humid habitats.

b. The coastal region, which extends from the northern foothills to the sea shore. It contains the lower reaches of the rivers (below the last falls). In the large rivers the influence of the tides remains noticeable at a considerable distance from the sea. In the estuaries the water is muddy and brackish (pl. 1 fig. 2). The salinity of the various waters not only depends on their distance from the sea, but also on the tide, and on the season. In the wet season, namely, more water is carried down by the rivers so that the sea water is pushed farther out, while furthermore the waters are directly freshened by the fallen rain. In the savannah area in the southern part of the coastal region the water of small streams is fresh, but often more or less acid; here the bottom is usually sandy, often covered by a thick layer of dead leaves. In the mouths of the large rivers an estuarine fauna is found consisting of marine prawns which pass in and out with each tide. The most common of these prawns are *Xiphopenaeus kroyeri* and *Palaemon schmitti*, while also *Acetes americanus*, *Penaeus aztecus*, *P. schmitti*, and *Hippolysmata oplophoroides* form part of this fauna. The actual sea shore is very poor in Decapoda, since its larger part consists of mud or tough clay with here and there a sandy spot; there are no rocks, while the coastal shelf is also muddy. The sandy areas of the sea shore make it possible for the sand-burrowing crab *Ocyrode quadrata* to live here. On the beaches the hermit crab *Clibanarius vittatus* is rather common, while several crabs like *Pachygrapsus gracilis*, *Sesarma ricordi*, and *Panopeus herbstii* are also found here. The soft muddy shores of the mouths of the rivers, and the mangrove vegetation along the sea coast and the river banks are the home

of many amphibious or land crabs like *Goniopsis cruentata*, *Pachygrapsus gracilis*, *Aratus pisonii*, the four species of *Sesarma*, the six species of *Uca*, and *Ucides cordatus*, while also the shrimps *Alpheus heterochaelis* and *Merguia rhizophorae* are to be found here. The edible swimming crab *Callinectes bocourti* is quite common in stagnant brackish waters. A number of prawns is found farther to the interior: *Macrobrachium carcinus* and *M. amazonicum* are usually found in the larger rivers, sometimes in parts that are brackish, while *Acetes paraguayensis*, *Palaemonetes carteri*, and *Macrobrachium jelskii* generally occur in smaller, usually fresh or slightly brackish waters, either stagnant or flowing (pl. II fig. 1). *Palaemonetes carteri* extends its range to close near the foothills, being sometimes found in acid savannah creeks. A typical inhabitant of the shaded acid savannah creeks is the peculiar shrimp *Euryrhynchus wrzesniowskii*.

d. The sea off the Suriname coast. The fauna of the inshore waters proves to be very poor in species, but as is demonstrated by the collections made by the trawler "Coquette", a great number of Decapoda occur at a distance of about 20 to 30 miles offshore. These species form more than half of the total number of Suriname species dealt with in the present paper.

D. ECONOMIC IMPORTANCE OF SURINAME DECAPODA

The economically most important Decapod in Suriname, at least as far as local consumption is concerned, is the prawn *Xiphopenaeus kroyeri*, which is caught in enormous numbers in the estuaries of all the large rivers and sold at the various markets either dried, fresh, or frozen. Until about the end of 1957 *Xiphopenaeus* was also exported in fairly great quantities. The dried prawns were mainly shipped to Trinidad, the frozen product to the U.S.A. A large modern shrimp factory was built in Paramaribo in 1956. Here the *Xiphopenaeus* prawns were cooked, peeled, frozen, and packed. The shrimps for this factory were bought from local fishermen. When, as a result of the investigations by the "Coquette", it became clear that considerable quantities of prawns belonging to the genus *Penaeus* (*P. brasiliensis*, *P. aztecus*, and *P. schmitti*) do occur off the Suriname coast, a fishery on these animals was started. At present two American fishing vessels operate off Suriname, selling their catches to the above mentioned shrimp factory in Paramaribo, which is the property of the S.A.I.L. (Suriname-American Industries Ltd.). This factory has now almost entirely changed over from *Xiphopenaeus* to the larger *Penaeus*, which, like *Xiphopenaeus* before, is now exported frozen to the U.S.A. It is to be expected that four more fishing vessels will join the two that are now in operation.

The species of Suriname Decapoda which for local consumption ranks

second in importance is the prawn *Palaemon schmitti*, which occurs together with *Xiphopenaeus* in the river mouths. It is sold either fresh or dried. The dried product is exported on a small scale. Other estuarine prawns, like *Penaeus aztecus*, *P. schmitti*, *Hippolysmata oplophoroides*, and *Acetes americanus* are sold locally with *Xiphopenaeus kroyeri* and *Palaemon schmitti*, but are caught in too small a quantity to be of much economic importance. The fresh water prawn *Macrobrachium carcinus*, and perhaps also *M. amazonicum*, is caught and eaten in Suriname, but is too scarce to be of much value as a food product.

Among the crabs both *Ucides cordatus* and *Callinectes bocourti* are much eaten and are offered alive for sale on the markets; also *Ocypode quadrata* seems to be used as food. Of all crabs it is *Ucides* which seems to be most important from an economic point of view, but, like the other species, it is only used locally and is not exported. Fresh water crabs are eaten, but are not highly valued.

No Suriname Crustacea have thus far been reported as being actually harmful to man. In the Coronie Polder innumerable fiddler crabs belonging to three species (*Uca rapax*, *U. mordax*, and *U. vocator*) make their holes in the banks of the ditches inside the dike of the polder (pl. II fig. 2); the fear was expressed that these myriads of burrows might be harmful to the solidity of the dike. There seems to be little chance, however, that this is true, since the burrows are more or less vertical and thus do not undermine the dike, as for instance do the burrows of the mitten crab (*Eriocheir sinensis* H. Milne Edwards), which at one time formed a danger to the dikes in the Netherlands. Reports that some crabs are poisonous (cf. *Uca maracoani*) have so far not been substantiated.

E. ENEMIES OF SURINAME DECAPODA

The most important enemy of the crabs and shrimps of Suriname of course is man (see chapter D), but there are also many other animal predators of Suriname Crustacea.

Of three Suriname mammals it has been claimed that they feed mainly on crabs, and for this reason specific names like *cancrivorus* or *carcinophagus* have been given to them at one time or another. The crab-eating habit has been proven without doubt for the Kraboe-dagoe (= Crab dog), *Procyon cancrivorus* (Cuvier, 1798), a raccoon, which inhabits the coastal area of Suriname and feeds on crabs, birds, lizards, frogs, insects, and fruit. On the sandy sea shore near the mouth of the Matappica Canal, I saw several holes of *Ocypode quadrata* showing traces of the work of a crab-dog, which had tried to dig the crabs out of their burrows. Sanderson (1949, p. 771)

described the way in which *Procyon* treated crabs as follows: "These animals are omnivorous, but as the popular name implies, are fond of crabs. The animals crouch on the hind legs and gently pat or "tread" the live crabs with the fore-feet until they are battered and partly insensible. They are then seized with the mouth. Even small crabs are dealt with in this manner. The whole crab is crunched up and swallowed and the sharp-edged, angular shell fragments pack the exceedingly thin transparent intestine in such a manner that it is hard to explain why they fail to perforate its walls". This account checks well with Durrell's (1958, p. 157) observations made in British Guiana: "I caught some river crabs and put them in with the raccoon . . . When he saw the crabs he surveyed them with a slightly worried expression, and then, choosing a large one, he squatted down in front of it and began to pat and stroke it swiftly and gently, occasionally stopping and shaking his paws. The crab made wild lunges with its pincers, but the raccoon's paws were too swift to be caught; then it retreated, but the raccoon followed it, still patting. After ten minutes of this the crab, though quite undamaged, was exhausted and had given up trying to defend itself with its pincers. This was the moment the raccoon had been waiting for: he leant forward suddenly and bit the unfortunate crab in half. Then he sat back and mournfully watched its death throes; when it had stopped twitching he picked it up daintily between the tips of his toes and popped it into his mouth, scrunching and swallowing with a look of acute melancholy on his face". Schomburgk (1848, p. 443) gave a different version: "So wie er eine Krabbe gefangen, beisst er ihr zuvörderst die Scheeren ab, um die Beute ruhig verzehren zu können".

The crab eating habits of the other two mammals need confirmation. The species name of the common Suriname Opossum, *Didelphis marsupialis* (L., 1758) has as its synonyms *Didelphis karkinophaga* Zimmermann, 1780, *D. carcinophaga* Boddaert, 1784, and *D. cancrivora* Gmelin, 1788, all of which are based on Buffon's (1776, p. 272, pl. 54) "Le Crabier". Buffon's animal came from French Guiana and was said by its author to feed mainly on crabs: "les crabes font sa principale nourriture, & lui profitent, car il est toujours gras. Quand il ne peut pas tirer les crabes de leur trou avec sa patte, il y introduit sa queue, dont il se sert comme d'un crochet; le crabe qui lui serre quelquefois la queue le fait crier . . ." (p. 274). Also on Buffon's plate the animal is figured with some crabs. Buffon's story is based entirely on second-hand information, which at least partly (viz., the part pertaining to the way in which the opossum catches the crabs with its tail) seems to rest on pure imagination. The most recent information that I could find concerning the feeding habits of the Suriname opossum is that given by

Cabrera & Yepes (1940, pp. 22, 23), who name the species "Mbicuré cangrejero" explaining that "el apelativo cangrejero con que aquí lo distinguimos es la traducción del nombre *crabier* que suelen darle los franceses de la Guayana, y le conviene perfectamente por constituir los cangrejos de agua dulce, según parece, su alimento predilecto". They further note that the animals feed on small mammals, birds, insects, crustaceans, and fruit, while those that live near the sea shore also are fond of marine crabs. Buffon's story about the capture of crabs by the opossum by means of its tail is considered "una linda fábula".

The third Suriname mammal which has been said to eat preferably crabs is the South American fox, *Dusicyon thous* (L., 1766), which has among its synonyms the name *Viverra cancrivora* Brongniart, 1792. According to Cabrera & Yepes (1940, p. 130), however, observations by modern zoologists do not confirm the assertion of older authors that the species prefers crabs to all other food. The diet of this fox seems to consist mainly of small mammals and birds, insects (grasshoppers and beetles), and fruit. It also eats small turtles, and therefore, according to Cabrera & Yepes, it would not be surprising if it occasionally also does eat crabs, but these certainly do not form its main food.

Among the Suriname birds there are many species that feed on Crustacea. Several of the Ardeidae like *Florida caerulea* (L.), *Nyctanassa violacea cayennensis* (Gmelin) and *Butorides striatus* (L.) are known to eat crabs, while *Cochlearius cochlearius* (L.), the "Krabbeneter" (= crab eater), belonging to the family Cochleariidae, even derived its Dutch name from that habit. Some of the birds of prey as *Heterospizias meridionalis* (Latham) and *Buteo albicaudatus colonus* Berlepsch have been reported to occasionally eat crabs, but the two best known crab eaters among the Suriname birds are the Kraboe-akka (= crab falcon), *Buteogallus aequinoctialis* (Gmelin), and the Kraboe-owroekoekoe (= crab owl), *Pulsatrix perspicillata* (Latham). According to the brothers Penard (1908, p. 401), who indicate the species as *Busarellus nigricollis*, the Kraboe-akka is mostly found along the creeks and rivers, and especially in the mangrove forests along the coast. "Daar zitten ze meestal onbeweeglijk, loerende naar prooi, die grootendeels uit krabben, *Gecarcinus ruricola*, bestaat, hoewel ook kruipende dieren, visschen, garnalen, insecten, enz. niet versmaad worden" (there they are usually motionless perched, spying for prey, which largely consists of crabs, though reptiles, fish, shrimp, insects, etc. are not refused either). The name *Gecarcinus ruricola* used by the Penard brothers evidently is incorrect, it is clear that *Ucides cordatus* is meant. As to the food of the crab owl the Penard brothers remarked (1908, p. 457): "Hun prooi bestaat, gelijk de naam aan-

duidt, vooral uit krabben, hoewel ook reptielen en kleine zoogdieren niet versmaad worden" (their prey consists, as indicated by their name, mainly of crabs, though reptiles and small mammals are not refused either). As shown by the specimen of *Penaeus aztecus* found in the stomach of *Chloroceryle americana* (Gmel.) (see p. 64), enemies of Crustacea are also found among the kingfishers. The list of Suriname birds feeding on Decapoda probably is a long one, but the feeding habits of a large number of species are as yet very poorly known.

Also Suriname reptiles are known to eat Crustacea: Geijskes found a specimen of *Macrobrachium carcinus* in the stomach of a snake.

It is self-evident that a very great number of species of fish have to be ranged among the enemies of Suriname Decapoda, though little positive information on this subject is thus far available. As shown below two specimens of *Pseudothelphusa denticulata* have been found in the stomach of an electric eel, *Electrophorus electricus* (L.). Furthermore, Dr. Geijskes informed me that, when examining the stomach contents of fishes caught in the Nickerie district, he found that almost all specimens proved to have eaten either prawns or small crabs or both: *Selenaspis passany* (Cuv. & Val.) (prawns and small crabs), *Selenaspis herzbergi* (Bloch) (prawns and crabs), *Elops saurus* L. (prawns), *Centropomus undecimalis* (Bloch) (prawns and small crabs).

Also among the invertebrates several species feed on Decapoda. The only positive record in this connection as far as Suriname material is concerned, is that of an octopus having partly swallowed a specimen of *Trachypenaeus constrictus* (Stimpson).

F. VERNACULAR NAMES

The vernacular names of Suriname Decapoda are far more numerous than appears from the present paper. The names given here are only those indicated on the labels of the specimens examined, those which I obtained with the help of Dr. Geijskes and Mr. Lijding during my visit to Suriname, and those mentioned in the literature.

Most of the names given here are in the Suriname language or "takki-takki", which originally is a kind of negro-english containing Dutch and Portuguese components; it is spoken throughout the coastal area. Furthermore some names are taken from various Indian languages, the most important of which are the Arowac and Carib. Some of the species have Dutch names, but these generally are mere translations of Suriname names. The Dutch speaking part of the Suriname population generally indicates the various species with their Suriname appellations.

The vernacular names given in the present paper are the following:

Suriname language:

bigi sara-sara (= big prawn)	<i>Xiphopenaeus kroyeri</i>
didibrie krabu (= devil's crab)	<i>Goniopsis cruentata</i>
kábu	<i>Trichodactylus spinifer</i>
kaka (= cock)	<i>Hippolysmata oplophoroides</i>
krabu	general term for crab
lontubaka	<i>Pseudothelphusa</i> spec. (?wymani)
odi odi botoman (= bye, bye, man in the boat)	<i>Uca</i> spec.
redi sara-sara (= red prawn)	<i>Xiphopenaeus kroyeri</i>
srika (or sirika)	<i>Callinectes bocourti</i>
stone sara-sara (= rock prawn)	<i>Macrobrachium carcinus</i>
tranga bakka (= strong back)	<i>Hippolysmata oplophoroides</i>
witti bere (= white belly)	<i>Palaemon schmitti</i>

Arowac language:

haralubata	<i>Callinectes bocourti</i>
kwa	<i>Ucides cordatus</i> (male)

Carib language:

kusa	<i>Ucides cordatus</i> (male)
waiamu	<i>Ucides cordatus</i> (female)

Oajana language:

waimoh	<i>Trichodactylus serratus</i>
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Dutch:

duivelskrab (= devil's crab)	<i>Goniopsis cruentata</i> , possibly also <i>Sesarma rectum</i> and <i>Uca maracoani</i>
garnaal	general term for prawns and shrimps
krab	general term for crabs
kreekkrab (= creek crab)	<i>Pseudothelphusa</i> spp.
landkrab (= land crab)	<i>Ucides cordatus</i>
rivierkrab (= river crab)	<i>Potamocarcinus latifrons</i>
rode duivelskrab (= red devil's crab)	<i>Goniopsis cruentata</i>
wenkkrab (= signalling crab)	<i>Uca</i> spec.
zwemkrab (= swimming crab)	<i>Callinectes bocourti</i>

G. NOTES ON THE SPECIES

Order Decapoda
 Suborder Macrura
 Supersection Natantia
 Section Penaeidea
 Family Sergestidae
 Subfamily Sergestinae

Acetes americanus Ortmann, 1893 (textfig. 1)

Acetes americanus Holthuis, 1948, p. 1105, fig. 1.

Coquette Investigations

Station 1, off the mouth of Suriname River, 6° 22' N 55° 06' W; bottom mud; depth 26 m; 11 May 1957. — 2 specimens. (W)

Station 2, off the mouth of Suriname River, 6° 23' N 55° 05.5' W; bottom mud; depth 27 m; 11 May 1957. — 98 specimens. (W + L)

Station 23, N.E. of the mouth of Suriname River, 6° 24' N 54° 59.5' W; bottom shells; depth 27 m; 12 May 1957. — 2 specimens. (W)

Station 44, N.E. of the mouth of Suriname River, 6° 18.5' N 54° 51' W; bottom mud; depth 18 m; 13 May 1957. — 12 specimens. (W)

Station 157, off the mouth of Suriname River, 6° 22' N 55° 03' W; bottom mud; depth 24 m; 4 June 1957. — 4 specimens. (W)

Station 260, between the mouths of the Coppename and Suriname Rivers, 6° 40'—6° 41.5' N 55° 26'—55° 41' W; bottom mud, shells and coral; depth 42 m; 20 June 1957. — 6 specimens. (W).

Museum Leiden

Mouth of Suriname River near Resolutie; in shrimp traps; bottom mud; water muddy brown; salinity 15.80‰; 22 December 1942; D. C. Geijskes. — 5 specimens.

Mouth of Suriname River; obtained at Paramaribo fish market; 1 April 1957; L. B. Holthuis no. 1207. — 1 specimen.

Fishmarket, Cayenne, French Guiana; 10 September 1957; J. Durand. — 3 specimens.

Description. Hansen, 1919, p. 45, figs. 1-7 (as *A. brasiliensis*).

Remarks. The length of the specimens examined varies from 15 to 26 mm. The female from near Resolutie has already been dealt with previously (Holthuis, 1948). The other female specimens resemble it quite closely, but show some variation in the depth of the posterior emargination of the genital sternite: in some specimens it is slightly deeper than figured by me in 1948, in others it is distinctly shallower.

The petasma of the males strongly resembles that figured by Burkenroad (1934, fig. 38) for his *Acetes americanus limonensis*. In my specimens, however, the petasma has the top of the distal lobe of the capitulum provided with minute teeth; such teeth are neither shown in Burkenroad's (1934)

figure nor in that by Hansen (1919, figs. 5, 6) illustrating the petasma of a Brazilian specimen.

Type locality. Mouth of the Pará (= Tocantins) River, Brazil.

Distribution. *Acetes americanus* inhabits the east coast of America from North Carolina (U.S.A.) to Brazil. Several forms have been recognized. The typical *Acetes a. americanus* Ortmann, 1893, is known from Brazil, the type locality being the mouth of the Pará River. The northern form is named *Acetes americanus carolinae* Hansen, 1933 (type locality: off Beaufort Inlet, North Carolina, U.S.A.). Between these extremes intermediate forms occur which give the impression that the northern form gradually

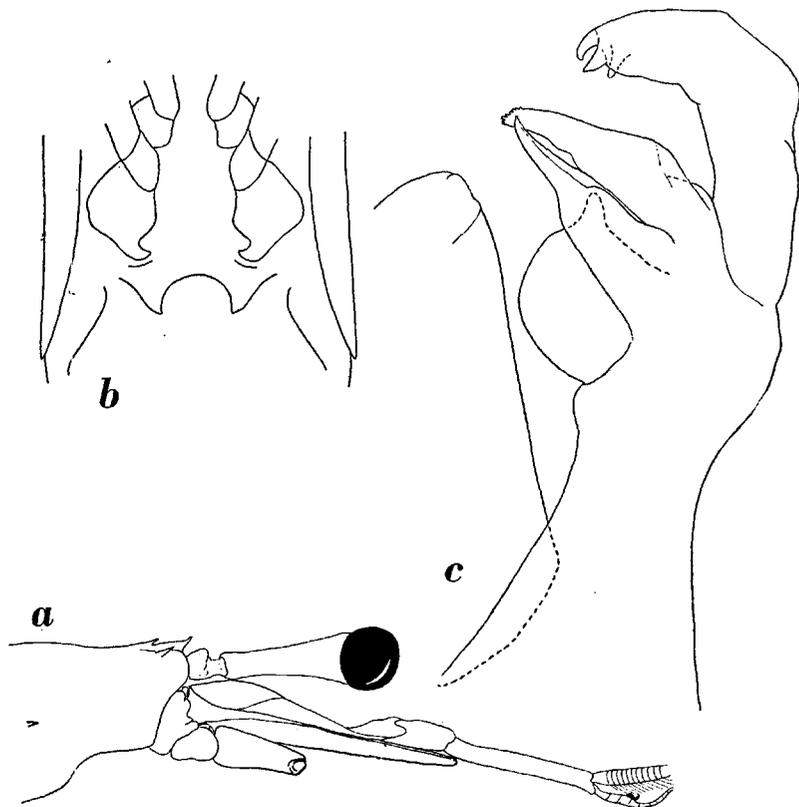


Fig. 1. *Acetes americanus* Ortmann. a, anterior part of body of male in lateral view; b, thelycum; c, tip of petasma. a, c, specimen from "Coquette" Sta. 2; b, specimen from Resolutie. a, b, $\times 16$; c, $\times 160$. b, after Holthuis, 1948.

passes into the southern, and that there is no need for coining separate names for all the intermediates (cf. Holthuis, 1948). Therefore the subspecies *Acetes carolinae louisianensis* Burkenroad, 1934 (type locality:

coast of Louisiana between the Mississippi River and Timbalier Island, U.S.A.), and *Acetes americanus limonensis* Burkenroad, 1934 (type locality: mouth of Sweetwater River, Limon Bay, Canal Zone, Panama) are not recognized here.

Occurrence in Suriname. The only previous record of the species from Suriname is that by Holthuis (1948) who reported upon the five above mentioned specimens from near Resolutie.

***Acetes paraguayensis* Hansen, 1919 (textfig. 2)**

Museum Leiden

Saramacca Canal, Paramaribo; 25 November 1957; D. C. Geijskes. — 1 male, 1 female.

Description. Hansen, 1919, p. 46, figs. 8-14.

Remarks. The male specimen is 19 mm, the female 23 mm long. In most characters these specimens closely agree with Hansen's description, but a few differences are to be observed. The second tooth of the rostrum is placed so close to the tip of the rostrum that the latter obtains a bifid

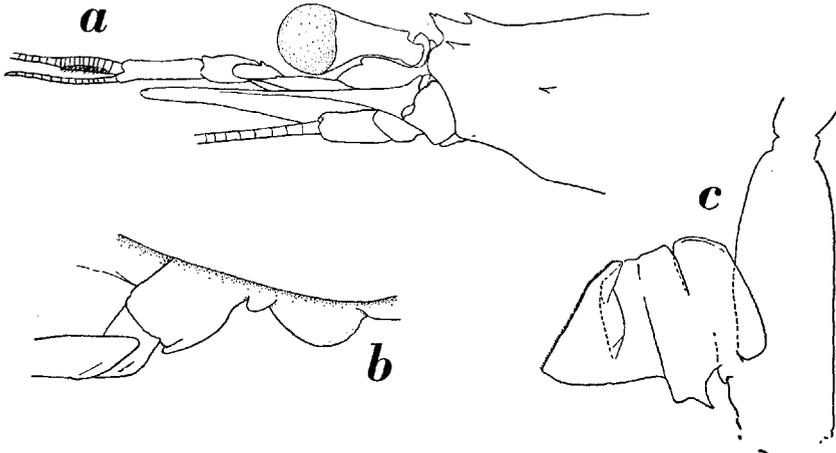


Fig. 2. *Acetes paraguayensis* Hansen. a, anterior part of body in lateral view; b, basal part of third pereiopod of female in lateral view; c, petasma. a-c, specimens from Saramacca Canal, Paramaribo. a, b, $\times 10$; c, $\times 25$.

appearance. The antennulae are exactly as Hansen described them for the types. The scaphocerite, however, is shorter, in the male reaching only slightly beyond the base of the third antennular segment, and in the female failing to reach the end of that segment.

The coxae of the third legs differ from Hansen's description in that the process which Hansen described as "large, oblong, acute" and figured as

a slender spine, in my specimens is low and rather broad, with a blunt tip. The genital area of the female strongly resembles that of the specimen figured by Hansen. Also the petasma is remarkably like that shown in Hansen's figure. The present figure shows the petasma of the Suriname male extended as far as possible; in a normal position the petasma has a more or less zig-zag shape, being three times longitudinally folded.

The differences found between my specimens and Hansen's original description do not warrant the separation of the Suriname form as a distinct species or subspecies, but a comparative study of an extensive material from both localities remains desirable.

Type localities. Lagoon of Río Paraguay near its junction with Río Paraná, and outlet of Riacho del Oro in Rio de La Plata. As Ringuélet (1949, p. 82) pointed out, the latter locality is doubtful; therefore the former is here selected as the restricted type locality. At the restricted type locality the water is fresh, while the water of Riacho del Oro was said to be feebly brackish.

Distribution. The species is known with certainty from the basin of Río Paraná. Apart from the two type localities the species has been mentioned also from Río Paraná Miní near La Invernada Island, Reconquista Department, Santa Fé Province, Argentina (Ringuélet, 1949). Burkenroad (1945, p. 562) stated that the "*Acetes paraguayensis* group" occurs in the Paraná as well as in the Amazon river systems. The species inhabiting the Amazon basin is evidently the one indicated by Burkenroad (1945, p. 563) as "*Acetes* sp. near *paraguayensis*".

Occurrence in Suriname. The species is now reported for the first time from Suriname. It was taken in the Saramacca Canal together with *Macrobrachium amazonicum* (Heller) and *M. jelskii* (Miers). The water probably was slightly brackish.

Subfamily Luciferinae

Lucifer faxoni Borradaile, 1915

Coquette Investigations

Station 2, off the mouth of the Suriname River, 6° 23' N 55° 05.5' W; bottom mud; depth 27 m; 11 May 1957. — 3 specimens. (W)

Station 15, N.E. of the mouth of the Suriname River, 6° 24.5' N 54° 59.5' W; bottom mud and shells; depth 29 m; 11 May 1957. — 67 specimens. (W + L)

Station 23, N.E. of the mouth of the Suriname River, 6° 24' N 54° 59.5' W; bottom shells; depth 27 m; 12 May 1957. — 2 specimens. (W)

Station 27, N.E. of the mouth of the Suriname River, 6° 45' N 54° 58' W; bottom hard mud and shells; depth 42 m; 12 May 1957. — 1 specimen. (W)

Station 281-282; between the mouths of the Coppename and Suriname Rivers,

6° 46'—6° 46.5' N 55° 36.5'—55° 38' W; bottom mud and fine shells; depth 46 m; 26 June 1957. — 3 specimens. (W)

Description. Hansen, 1919, p. 61, pl. 5 fig. 3.

Remarks. The material at hand agrees quite well with Hansen's (1919) account. *Lucifer faxoni* is one of the two species of the genus known from the Atlantic. The other species, *Lucifer typus* H. Milne Edwards, differs from the present form by the far longer eyes.

In his revision of the genus *Lucifer* Borradaile (1915) distinguished ten species, six of which were considered by him to be new. Since most of these new species are based on usually incomplete descriptions and figures published by previous authors, their standing is doubtful, and for this reason all of them, with the exception of *L. faxoni*, have been disregarded by Hansen (1919, p. 50). However, as long as the identity of these species is not definitely settled, their names will remain a threat to the nomenclatorial stability within this genus. By the indication of a proper specimen as the lectotype, several of these species will fall in the synonymy of older species and thus can be put safely out of the way. Six of the species enumerated by Borradaile were stated by him to inhabit the Atlantic Ocean, viz., the four long-eyed forms *Lucifer typus* H. Milne Edwards, 1837 ("Tropical N. Atlantic"), *L. acicularis* Dana, 1852 ("Harbour of Rio de Janeiro"), *L. clausi* Borradaile, 1915 ("Messina"), *L. batei* Borradaile, 1915 ("Throughout the warmer parts of the Atlantic and Central Pacific"), and the two short-eyed forms *L. faxoni* Borradaile, 1915 ("N.W. Atlantic. E. Subtropical Atlantic (Brit. Antarc. Exped.)? Near Philippine Is."), and *L. affinis* Borradaile, 1915 ("Various localities in the Tropical and Subtropical Atlantic, Pacific, and Indian Oceans"). The fact that, as Hansen (1919) pointed out, the only long-eyed species in the Atlantic is *L. typus*, makes it clear that *L. acicularis* Dana and *L. clausi* Borradaile are synonymous with that species. *L. batei* Borradaile also may be made a synonym of *L. typus* by the selection of an Atlantic specimen as its lectotype; to this end I now select as the lectotype of *Lucifer batei* Borradaile a specimen from "Floridastrom: J.N. 62" reported upon by Ortmann (1893, p. 40) as *Lucifer reynaudi*; all of Ortmann's material identified by him as *L. reynaudi*, namely, was assigned by Borradaile to his new species *Lucifer batei*. The position of station "Floridastrom: J.N. 62" of the German Plankton-Expedition is at Bermuda, which thereby becomes the restricted type locality of *Lucifer batei* Borradaile, 1915. The latter species now definitely has become a synonym of *Lucifer typus* H. Milne Edwards, 1837.

As far as the short-eyed forms are concerned, here too a lectotype should be chosen in order to fix their identity. For this reason I now select as

the lectotype of *Lucifer faxoni* Borradaile, 1915, the specimen figured by Faxon (1878, pl. 7 figs. 1-3) under the name *Lucifer* sp., which originated from off Chesapeake Bay, U.S.A. This latter locality now is the restricted type locality of *L. faxoni*. As the lectotype of *Lucifer affinis* Borradaile, 1915, the specimen from "Floridastrom: J.N. 56" reported upon by Ortman (1893, p. 40) as *Lucifer typus*, is now selected. The restricted type locality of *L. affinis* hereby becomes a locality N.E. of Bermuda, roughly about 35° N 60° W. On account of these lectotype selections *Lucifer affinis* and *L. faxoni* are now subjective synonyms. As the two names have been proposed in the same publication, they are nomenclatorially of equal standing and it is up to the first reviser to select one of them to be used in preference to the other. As far as is known to me such a selection has not yet been made and for that reason the name *Lucifer faxoni* is indicated here to be treated as if it were a senior subjective synonym of *L. affinis*. This selection is made in the interest of stability since the name *L. faxoni* is generally used by modern authors, while that of *L. affinis* is ignored by practically all.

Type locality. See previous paragraph.

Distribution. *Lucifer faxoni* is known from the E. and W. Atlantic and the Indo-West Pacific area (Red Sea, Malay Archipelago, Marshall Islands, Hawaiian Islands, and Fanning Island). The western Atlantic localities are: Off Nova Scotia (41° 07' N 66° 25' W, 40° 10' N 60° 25' W, and 40° 08' N 59° 25' W), N.E. of Bermuda, the coast of the U.S.A. (off Chesapeake Bay, North Carolina, Florida, Louisiana), Bahamas, West Indies (S. E. of Jamaica; St. John), Venezuela (Puerto Cabello), Brazil (mouth of Pará River; near St. Paul's Rock; near Fernando Noronha; near Rio de Janeiro), mid-Atlantic (42° 50' 26" N 41° 48' W, 41° 39' 34" N 39° 21' W, and 4° 30' N 28° 20' W). The species is now reported for the first time from off the Suriname coast.

Family Penaeidae

Subfamily Solenocerinae

Solenocera atlantidis Burkenroad, 1939 (textfig. 3)

Coquette Investigations

Station 4, off the mouth of the Suriname River, 6° 25' N 55° 05' W; depth 29 m; 11 May 1957. — 6 specimens. (L)

Station 5, off the mouth of the Suriname River, 6° 25' N 55° 04' W; bottom grey mud and shells; depth 27 m; 11 May 1957. — 6 specimens. (L)

Station 6, off the mouth of the Suriname River, 6° 24.5' N 55° 03' W; bottom grey mud and shells; depth 27 m; 11 May 1957. — 1 specimen. (L)

Station 8, off the mouth of the Suriname River, 6° 24' N 55° 02.5' W; bottom grey mud and shells; depth 27 m; 11 May 1957. — 10 specimens. (L)

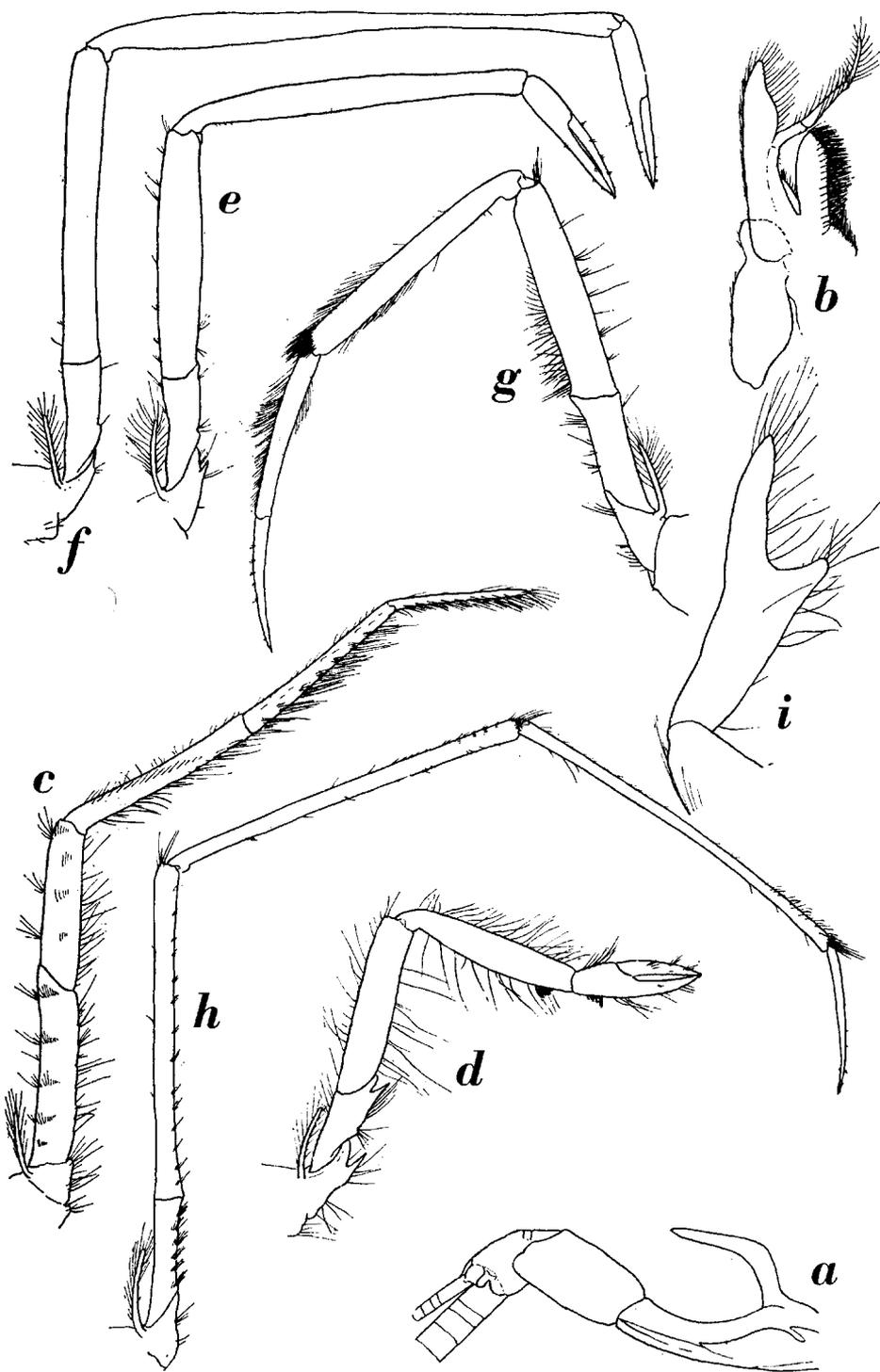


Fig. 3. *Solenocera atlantidis* Burkenroad. a, antennular peduncle in lateral view; b, first maxilliped; c, third maxilliped; d, first pereopod; e, second pereopod; f, third pereopod; g, fourth pereopod; h, fifth pereopod; i, epipod of pereopod. a-h, $\times 7$; i, $\times 20$.

Station 44, N.E. of the mouth of the Suriname River, $6^{\circ} 18.5' N$ $54^{\circ} 51' W$; bottom mud; depth 13 m; 13 May 1957. — 1 specimen. (W)

Station 260, between the mouths of the Coppename and Suriname Rivers, $6^{\circ} 40' - 6^{\circ} 41.5' N$ $55^{\circ} 26' - 55^{\circ} 41' W$; bottom mud, shells and coral; depth 42 m; 20 June 1957. — 4 specimens. (W)

Station 267, between the mouths of the Coppename and Suriname Rivers, $6^{\circ} 42' - 6^{\circ} 41' N$ $55^{\circ} 43' - 55^{\circ} 45' W$; bottom mud and fine shells; depth 44 m; 20 June 1957. — 5 specimens. (W)

Station 274, between the mouths of the Coppename and Suriname Rivers, $6^{\circ} 41' N$ $55^{\circ} 27' W$; bottom shells and coral; depth 42 m; 25 June 1957. — 9 specimens. (W)

Station 276, between the mouths of the Coppename and Suriname Rivers, $6^{\circ} 41.5' N$ $55^{\circ} 31' W$; bottom shells and coral; depth 42 m; 25 June 1957. — 11 specimens. (W)

Station 281-282, between the mouths of the Coppename and Suriname Rivers, $6^{\circ} 46' - 6^{\circ} 46.5' N$ $55^{\circ} 36.5' - 55^{\circ} 38' W$; bottom mud and fine shells; depth 46 m; 26 June 1957. — 3 specimens. (W)

Station 283, between the mouths of the Coppename and Suriname Rivers, $6^{\circ} 47' N$ $55^{\circ} 40' W$; bottom mud and fine shells; depth 46 m; 26 June 1957. — 6 specimens. (L)

Station 286, off the mouth of the Coppename River, $6^{\circ} 51' N$ $55^{\circ} 49' W$; bottom mud, sponges and shells; depth 48 m; 26 June 1957. — 2 specimens. (L)

Station 289, off the mouth of the Coppename River, $6^{\circ} 52.5' N$ $55^{\circ} 53' W$; bottom mud and fine shells; depth 49 m; 27 June 1957. — 9 specimens. (L)

Station 298, off the mouth of the Suriname River, $6^{\circ} 45' N$ $55^{\circ} 17' W$; bottom mud and fine shells; depth 44 m; 28 June 1957. — 3 specimens. (L)

Station 353, off the mouth of the Suriname River, $6^{\circ} 45.5' N$ $55^{\circ} 14' W$; bottom mud and fine shells; depth 44 m; 21 July 1957. — 4 specimens. (W)

Between the mouths of the Coppename and Suriname Rivers, $6^{\circ} 38' - 6^{\circ} 55' N$ $55^{\circ} 13' - 55^{\circ} 40' W$; depth 26-53 m; 19 to 22 July 1957. — 1 specimen. (L)

Off Suriname, 1957. — 21 specimens. (W)

Description. Burkenroad, 1939, p. 10, figs. 5-10.

Remarks. The number of females in the present material (82) is far larger than that of the males (19). The females furthermore attain a much greater size, being 32 to 63 mm in my material, while the males are 37 to 43 mm long.

The specimens agree perfectly with Burkenroad's (1939) description and figures of this species.

Type locality. "Atlantis" Sta. 2813, off the coast of Alabama, U.S.A., roughly $30^{\circ} N$ $88^{\circ} W$, depth 35 m.

Distribution. Until now *Solenocera atlantidis* was known only from several localities in the Gulf of Mexico near the mouth of the Mississippi River, while Burkenroad (1939) doubtfully referred a specimen from Venezuela to this species. It is now reported for the first time from Suriname.

***Solenocera geijskesi* new species (textfigs. 4 and 5)**

Coquette Investigations

N.N.W. of the mouth of the Marowijne River, about 20 miles offshore; depth 35 m; 8-12 April 1957; second voyage. — 1 female. (L)

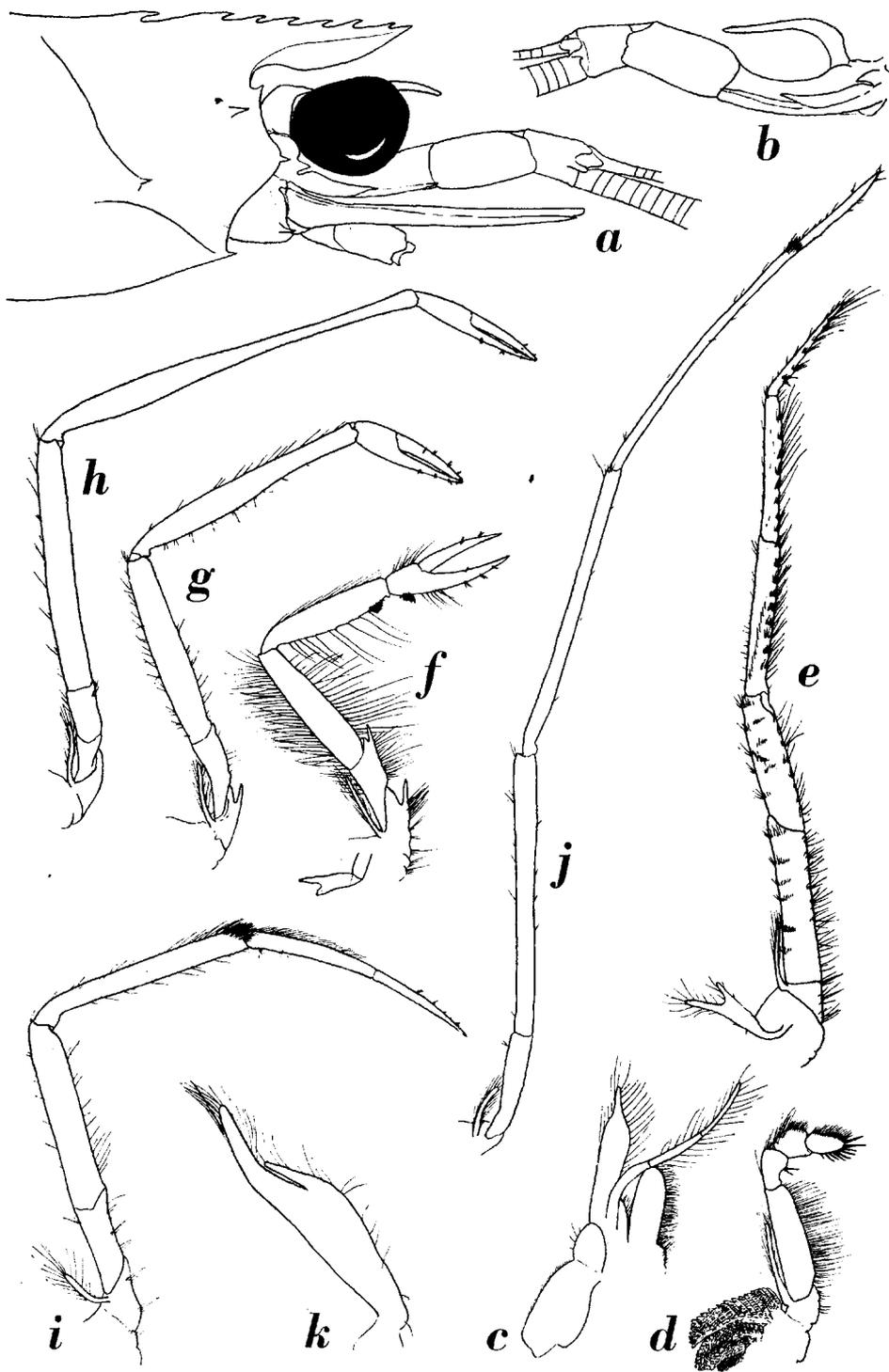


Fig. 4. *Solenocera geijskesi* new species. a, anterior part of body in lateral view; b, antennular peduncle in lateral view; c, first maxilliped; d, second maxilliped; e, third maxilliped; f, first pereopod; g, second pereopod; h, third pereopod; i, fourth pereopod; j, fifth pereopod; k, epipod of pereopod. a-j, $\times 7$; k, $\times 20$.

About 20 miles off the Suriname coast between the mouths of the Nickerie and Coppename Rivers; depth 27 m; 15-20 April 1957; third voyage. — 1 male. (L)

Station 260, between the mouths of the Coppename and Suriname Rivers, $6^{\circ} 40' - 6^{\circ} 41.5' N$ $55^{\circ} 26' - 55^{\circ} 41' W$; bottom mud, shells, and coral; depth 42 m; 20 June 1957. — 1 female. (W)

Off Suriname: 1957. — 1 male. (W)

Museum Leiden

Off the coast of French Guiana, about $6^{\circ} 02' N$ $52^{\circ} 25' W$; depth 67 m; 6 September 1957; J. Durand no. 379. — 1 female.

Off the coast of French Guiana, about $5^{\circ} 17' N$ $52^{\circ} 14' W$; depth 35 m; 11 July 1958; J. Durand no. 411. — 1 male, 3 females.

Off the coast of French Guiana, about $5^{\circ} 17' N$ $51^{\circ} 25' W - 5^{\circ} 27' N$ $51^{\circ} 40' W$; depth 55-70 m; 7 August 1958; J. Durand no. 424-425. — 2 females.

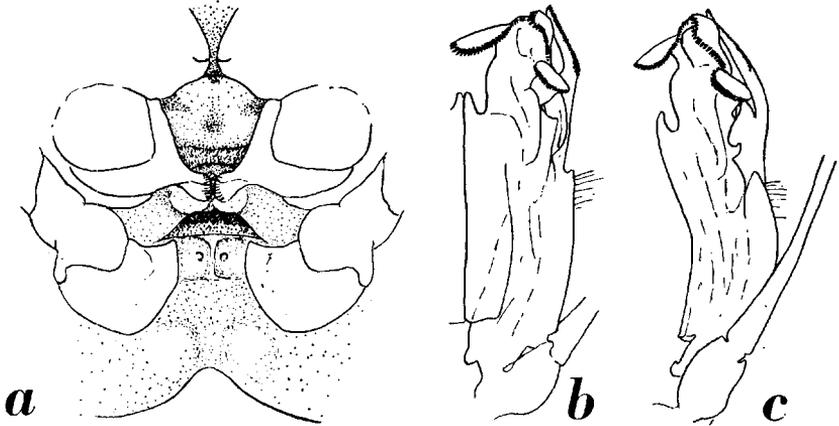


Fig. 5. *Solenocera geijskesi* new species. a, thelycum; b, right petasma in anterior view; c, right petasma in lateral view. a-c, $\times 8$.

Description. The males are 34 to 39 mm long, the females 30 to 70 mm.

The rostrum reaches almost to (in the male) or slightly beyond (in the female) the end of the basal segment of the antennular peduncle. It is straight and provided with seven or eight dorsal teeth, three of which are placed behind the orbit. The first tooth, which stands at one third of the length of the carapace behind the orbit, is separated from the second by an interval which is much larger than the spaces between the other teeth. The dorsal surface of the carapace is rounded in its posterior half and shows no median carina. The lateral carina of the rostrum is placed slightly closer to the upper margin than to the lower; the latter is unarmed and distinctly convex. The orbital angle is acute. Postorbital, antennal, hepatic, and pterygostomian spines are present, they are very similar to those of *S.*

atlantidis; the pterygostomial spine forms a right angle with the anterior margin of the carapace. The cervical groove, like in *S. atlantidis*, is distinct laterally, but does hardly show in the middorsal line of the carapace. Short hairs are present in the anterior part of the carapace.

The first two abdominal somites have the dorsal surface rounded, while the third shows a rather indistinct dorso-median carina in its posterior half. The posterior margin of the third somite is incised in the middle. The fourth, fifth and sixth somites are sharply carinate throughout dorsally. The posterior margins of the fourth and fifth somites are incised in the middle, while the sixth somite bears a distinct postero-median spine. The shape of the pleurae is practically identical with that in *S. atlantidis*. Also the telson does not show any important difference from that of the latter species.

The eyes of *S. geijskesi* are similar to those of *S. atlantidis*.

In the present species the antennula is more slender than in *S. atlantidis*. The anterolateral tooth of the basal segment reaches distinctly beyond the end of the segment itself. The prosartema is very slender and overreaches the basal antennular segment, it also projects distinctly beyond the eyes; it is relatively far longer than in *S. atlantidis*. The distal two segments of the antennular peduncle resemble those of *S. atlantidis*, but are considerably more slender. Also the antennae are more slender in the new species, but the difference in this respect is very small.

The oral parts strongly resemble those of *S. atlantidis*. The laminate part of the exopod of the first maxilliped, however, is distinctly narrower in its distal part than it is in Burkenroad's species. In the male the third maxilliped reaches with the dactylus and a small part of the propodus beyond the scaphocerite; in the female only part of the dactylus overreaches that scale. The third maxilliped is slender, but less so than in *S. atlantidis*. The dactylus is somewhat shorter than the propodus. The carpus is somewhat longer than the propodus, distinctly longer than the merus, but slightly shorter than the ischium. This maxilliped strongly resembles that of *S. atlantidis*, but has the carpus relatively shorter: in specimens of the latter species I found the carpus always longer than the ischium.

The first pereopod of the male reaches to or somewhat beyond the end of the antennal peduncle, in the female it attains only the base of the scaphocerite or reaches slightly beyond. The fingers are about 2 to 2.5 times as long as the palm. The carpus is slightly longer than the chela and about as long as the merus. Both ischium and basis are provided with a strong inner spine. The second pereopod reaches to the middle of the second or to that of the third segment of the antennular peduncle. The fingers are

almost twice as long as the palm. The carpus is twice to somewhat more than twice as long as the chela, and is distinctly longer than the merus. The inner margin of the basis shows a strong spine, but no such spine is visible on the ischium. The third leg reaches with its fingers or with the chela beyond the scaphocerite. The fingers are somewhat less than 1.5 times as long as the palm. The carpus is about three times as long as the chela and distinctly more than 1.5 times as long as the merus. Neither basis nor ischium bears a spine. The fourth leg reaches to or somewhat beyond the end of the antennal peduncle. The dactylus is shorter than the propodus, and about half as long as the carpus. The merus is shorter than the carpus. The fifth leg is very slender and reaches with the dactylus and a small part of the propodus beyond the scaphocerite. The propodus is slightly shorter than the carpus and distinctly more than 2.5 times as long as the dactylus. The merus is slightly shorter than the carpus. The epipods, which are present at the bases of the first four pereopods, are distinctly bifid, and do not differ much from those of *S. atlantidis*.

The pereopods of the present species strongly resemble those of *S. atlantidis*, but on the whole are less slender. The first leg of *S. atlantidis* has the chela distinctly shorter than the carpus, and the fingers about twice as long as the palm. The second leg of that species reaches almost to or slightly beyond the scaphocerite. The fingers are distinctly less than twice as long as the palm, the carpus is slightly more than twice to 2.5 times as long as the chela and almost 1.5 times as long as the merus. The third leg reaches with the chela or part of the carpus beyond the scaphocerite. The fingers are only slightly longer than the palm. The carpus is about three times as long as the chela and about 1.7 times as long as the merus. The fourth leg almost attains the end of the scaphocerite. In *S. atlantidis* the ratio between the lengths of the various joints is much like in *S. geijskesi*. The fifth leg reaches with the dactylus or part of the propodus beyond the scaphocerite. The propodus is about as long as the carpus and 2.5 times as long as the dactylus.

The main difference between *S. geijskesi* and *S. atlantidis* is found in the shape of the petasma. The tip of the distolateral lobe, instead of being directed distally as in *S. atlantidis*, is recurved here and is directed inwards towards the median line. Furthermore the distoventral lobe shows a well developed free projection, which reaches as far as the distal end of the distolateral lobe. Like in *S. atlantidis*, the distal margin of the distolateral lobe is cut into three lobules, the margin of these bearing spinules. Also the distal part of the external margin of the projection of the distoventral lobe bears spinules.

The thelycum of *S. geijskesi* shows some resemblance to that of *S. atlantidis*. In *S. atlantidis* the sternite of the thirteenth somite, anterior to the medially directed processes at the bases of the fourth pereopods is evenly convex, in *S. geijskesi* a conspicuous ciliated transverse ridge is visible just before these processes. Furthermore the two submedian rounded protuberances of the fourteenth somite, which are placed between the bases of the last pereopods, are evenly rounded in *S. atlantidis*, while they show a distinct tubercle on top in *S. geijskesi*. In *S. geijskesi* there is a ridge between these protuberances; this ridge lacks in *S. atlantidis*.

Types. Holotype is the male specimen from between the mouths of the Nickerie and Coppename Rivers (Leiden Mus. Reg. No. Crustacea D. 11248). The other specimens are paratypes.

Remarks. The present species belongs in the group of the genus *Solenocera* containing the species *S. atlantidis* Burkenroad, *S. necopinum* Burkenroad and *S. vioscai* Burkenroad from the western Atlantic, *S. membranaceum* (Risso) from the eastern Atlantic, and *S. agassizii* Faxon, *S. floreum* Burkenroad, and *S. mutator* Burkenroad from the American westcoast. Of the western Atlantic species *S. geijskesi* is closest to *S. atlantidis*; the differences between the two have been pointed out above. Of the other species it is to *S. floreum* that *S. geijskesi* is most closely related, especially the petasma of the two showing a strong resemblance; the armature of the two outer lobules of the distolateral lobe, however, is different. The thelycum of *S. floreum* also shows the tubercles on the rounded protuberances of the sternite between the last pereopods, but the sculpturation of the thirteenth sternite is different, lacking the transverse ridge of *S. geijskesi*.

Subfamily Penaeinae

Penaeus schmitti Burkenroad, 1936 (textfig. 6a)

Penaeus schmitti Lindner, 1957, pp. 153, 154.

Coquette Investigations

About 20 miles off the Suriname coast between the mouths of the Nickerie and Coppename Rivers; depth 27 m; 15-20 April 1957; third voyage. — 2 males. (L)

Station 176, off the mouth of the Coppename River, 6° 20' N 55° 49.5' W; bottom mud and shells; depth 27 m; 6 June 1957. — 1 female. (L)

Station 203, N.E. of the mouth of the Suriname River, 6° 22'—6° 23' N 54° 56'—55° 05' W; bottom mud; depth 24 m; 11 June 1957. — 1 male. (W)

Station 208, off the mouth of the Suriname River, 6° 22' N 55° 03'—55° 08' W; bottom mud; depth 24 m; 11 June 1957. — 1 female. (W)

Station 293, off the mouth of the Suriname River, 6° 27'—6° 25' N 55° 05'—55° 10' W; bottom mud and shells; depth 26 m; 28 June 1957. — 3 males. (W+L)