World Catalog of the Beach-Fly Family Canacidae (Diptera)

WAYNE N. MATHIS

SMITHSONIAN CONTRIBUTIONS TO ZOOLOGY • NUMBER 536
Emphasis upon publication as a means of “diffusing knowledge” was expressed by the first Secretary of the Smithsonian. In his formal plan for the Institution, Joseph Henry outlined a program that included the following statement: “It is proposed to publish a series of reports, giving an account of the new discoveries in science, and of the changes made from year to year in all branches of knowledge.” This theme of basic research has been adhered to through the years by thousands of titles issued in series publications under the Smithsonian imprint, commencing with *Smithsonian Contributions to Knowledge* in 1848 and continuing with the following active series:

- *Smithsonian Contributions to Anthropology*
- *Smithsonian Contributions to Astrophysics*
- *Smithsonian Contributions to Botany*
- *Smithsonian Contributions to the Earth Sciences*
- *Smithsonian Contributions to the Marine Sciences*
- *Smithsonian Contributions to Paleobiology*
- *Smithsonian Contributions to Zoology*
- *Smithsonian Folklife Studies*
- *Smithsonian Studies in Air and Space*
- *Smithsonian Studies in History and Technology*

In these series, the Institution publishes small papers and full-scale monographs that report the research and collections of its various museums and bureaus or of professional colleagues in the world of science and scholarship. The publications are distributed by mailing lists to libraries, universities, and similar institutions throughout the world.

Papers or monographs submitted for series publication are received by the Smithsonian Institution Press, subject to its own review for format and style, only through departments of the various Smithsonian museums or bureaus, where the manuscripts are given substantive review. Press requirements for manuscript and art preparation are outlined on the inside back cover.

Robert McC. Adams
Secretary
Smithsonian Institution
World Catalog of the Beach-Fly Family Canacidae (Diptera)

Wayne N. Mathis
ABSTRACT

Mathis, Wayne N. World Catalog of the Beach-Fly Family Canacidae (Diptera). Smithsonian Contributions to Zoology, number 536, 18 pages, 1992.—All genera and species of the dipterous family Canacidae, more commonly known as beach or surf flies, are cataloged. Included are 113 species and 12 genera that are arranged within a classification of two tribes and three subfamilies. The distribution of each species is given by major zoogeographic region(s) and country(ies) within each region. Information on the natural history, as available in the literature, and depository of primary types are also provided.
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Format</td>
<td>1</td>
</tr>
<tr>
<td>Faunal Treatments</td>
<td>2</td>
</tr>
<tr>
<td>Revisionary Treatments</td>
<td>2</td>
</tr>
<tr>
<td>Abbreviations</td>
<td>2</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>3</td>
</tr>
<tr>
<td>Catalog</td>
<td>3</td>
</tr>
<tr>
<td>Literature Cited</td>
<td>14</td>
</tr>
<tr>
<td>Index</td>
<td>18</td>
</tr>
</tbody>
</table>
World Catalog of the Beach-Fly
Family Canacidae (Diptera)

Wayne N. Mathis

Introduction

True flies of the family Canacidae, more commonly known as beach or surf flies, are found in temperate and tropical zones throughout the world, usually in association with maritime beaches. The family has comparatively few species, at least by hexapod standards, and except for Wirth's review (1951), the family has never been treated comprehensively. Wirth's paper is now of limited use, especially at the species level, where less than one-third of the present species were treated (32 of 113 species). Most species and several genera have been described since 1951, and few comprehensive treatments are now available except on a regional level (see review of faunal and revisionary papers below). The purpose of this paper is to partially address the lack of comprehensive works through publication of this catalog, which is intended to have worldwide coverage and to include all taxa that have been described.

Catalogs or checklists are an indispensable tool for anyone needing an up-to-date reference to a currently accepted name and frequently to other pertinent information such as bibliographic and distributional data. This is so because most information is filed under a species' scientific name, which then becomes the key to retrieval of information from the literature. The system, however, is dynamic and subject to interpretation. The taxonomic literature is constantly changing to reflect current work, and some species are known by several names. Thus a complete listing of names, including synonyms, is an important starting point for locating information, whether as the basis for applied and basic research or simply to satisfy a curiosity.

The information included in a catalog is usually arranged in a logical and organized format that allows for its convenient and rapid conveyance—in short, a quick and easy storage and retrieval system. The format and amount of information presented varies greatly, however, and these issues have in part led to semantic debates over differences between the terms "checklist" and "catalog" and attempts to obviate the issue through use of a more neutral term, such as database (Cogan et al., 1980; Thompson and Knutson, 1987). My use of the term catalog is intended to convey a more comprehensive treatment, including information on all valid names, synonyms, type species, and deposition of primary types. The bibliographic section includes complete references (author, date, original and most subsequent citations), and distributional and other biotic information, as available in the literature, are also provided. Not all citations that occur in the literature of beach flies are included in this catalog or the bibliography section, especially where I suspect that the species being treated was misidentified, and inclusion would further promulgate inaccurate distributional data.

The sequence of taxa, especially at the generic level and above, should not be interpreted to represent a phylogenetic scheme. Indeed, one subfamily, Zaleinae, comprising only three species, is only questionably included in the family and in this catalog. When McAlpine (1982, 1985) proposed Zaleinae he was unsure of its phylogenetic relationship, although he did associate it with the Canacidae. Others have followed that precedent (Mathis, 1989a), mostly for convenience and completeness. The phylogenetic relationships of Zaleinae remain enigmatic, however, and further study may reveal its placement elsewhere, such as with the Tethinidae.

FORMAT.—The format I have adopted follows that advocated by systematists from the Systematic Entomology Laboratory (United States Department of Agriculture) (Hodges, pers. comm.). Details are illustrated in the following hypothetical examples of generic and species entries (genera Xus and Yus and species albus and zeus). All valid generic and species names are indicated in bold face type.

Genus Xus

Author(s) (number of species in the genus)

Xus Author(s), year: page. Type species: Xus albus Author(s), year, method of type designation.—Author(s), year: page [annotation(s)].

Yus Author(s), year: page. Type species: Yus zeus Author(s), year, method of type designation.—Author(s), year: page [annotation(s) such as "synonymy"].

albus Author(s). Geographic distribution by major faunal realm(s): Country (province or state).

Yus albus Author(s), year: page [primary type(s) and gender(s) (deposition information); type locality (Country, Province or state: specific locality (annotation(s) such as elevation or habitat)].—Author, year: page [annotation(s)].

Yus zeus Author(s), year: page [primary type(s) and gender(s) (deposition information); type locality (Country, Province or state: specific locality (annotation(s) such as elevation or habitat)].—Author, year: page [annotation(s) such as "synonymy"].

Yus zeus.—Author(s), year: page [annotation(s) such as "generic combination"].

Within a taxon, the subordinate taxa are listed alphabetically, i.e., genera within a tribe, species within a genus.

Although this is the first treatment of the family on a worldwide basis since Wirth (1951), there are several papers that treat beach flies on a regional basis. These may be of interest and use to the reader, and a summary of these and revisionary works are provided here.

FAUNAL TREATMENTS (papers listed chronologically under major faunal realms).—Afrotropical: Frey (1958b, fauna of the Cape Verde Islands); Wirth (1960, South African fauna); Mathis and Wirth (1979, Malagasy fauna); Cogan (1980, catalog); Canzoneri (1982, fauna of Sierra Leone); Canzoneri (1987, fauna of the Sudan); Mathis (1988b, fauna of the Seychelles); Mathis and Freidberg (1991, tribe Canacini and subfamily Nocticanacinae).


Nearctic: Wheeler (1952, fauna of the United States); Wirth (1965, catalog); Cole (1969, fauna of Western North America); Wirth (1987, general description and discussion of family, key to nearctic genera).


Oriental: Delfinado (1975, Sri Lankan fauna); Delfinado and Wirth (1977, catalog).

Palearctic: Becker (1926, palearctic fauna); Séguy (1934, fauna of France); Frey (1936, 1945, 1949, 1958a, faunas of the Canary Islands, Azores, Madeira, and Canary Islands respectively); Miyagi (1963, Korean fauna); Stackelberg (1970, western palearctic fauna); Cogan (1976, checklist of the British fauna); Mathis (1982a, fauna of Israel); Mathis and Freidberg (1982, review of western palearctic species); Cogan (1984, catalog).

REVISIONARY TREATMENTS (papers listed chronologically).—Wirth (1964, Trichocanace Wirth); Wirth (1969a, Canaceoides Cresson); Wirth (1970, the snodgrassii group = Canacea Cresson); Mathis and Wirth (1978, Paracanace Mathis and Wirth); Mathis (1982a, Canace Haliday); Mathis (1982b, Isocanace Mathis); McAlpine (1982, Zale McAlpine = Zalea McAlpine, 1985); Mathis, 1989b, the texensis group of Nociticanace Malloch).

ABBREVIATIONS.—To economize on space I have used well-known acronyms for museums, especially to indicate the deposition of a primary type(s), and also for some locality data. These abbreviations are as follows:

AM Australian Museum, Sydney, Australia
AMNH American Museum of Natural History, New York, New York, USA
ANSP Academy of Natural Sciences of Philadelphia, Pennsylvania, USA
BBM Bernice P. Bishop Museum, Honolulu, Hawaii, USA
BMNH former British Museum (Natural History), collections in The Natural History Museum, London, England
CAS California Academy of Sciences, San Francisco, California, USA
DEI former Deutsches Entomologisches Institut, collections in the Institut für Pflanzenschutzforschung, Zweigstelle Eberswalde, Abteilung Taxonomie der Insekten, Eberswalde, Germany
DCSA Dipterorum Collectionis Strobl, Admont, Austria
HUS Hokkaido University, Sapporo, Japan
IOC Instituto Oswaldo Cruz, Rio de Janeiro, Brazil
LACM Los Angeles County Museum of Natural History, Los Angeles, California, USA
MCV Museo Civico di Storia Naturale de Venezia, Venice, Italy
MNHN Museum National d'Histoire Naturelle, Paris, France
MRAC Musée Royal de l'Afrique Centrale (Koninklijk Museum voor Midden-Afrika), Tervuren, Belgium
NMI National Museum of Ireland, Dublin, Ireland
NMP Natal Museum, Pietermaritzburg, South Africa
NZAC New Zealand Arthropod Collection, Entomology Division, DSIR, Auckland, New Zealand
SUJ Saikyo University, Kyoto, Japan
SMN Staatliches Museum fur Naturkunde in Stuttgart, Ludwigsburg, Germany
TMC Transvaal Museum Collection, Pretoria, South Africa

Genus Xus

Author(s) (number of species in the genus)

Xus Author(s), year: page. Type species: Xus albus Author(s), year, method of type designation.—Author(s), year: page [annotation(s)].

Yus Author(s), year: page. Type species: Yus zeus Author(s), year, method of type designation.—Author(s), year: page [annotation(s) such as "synonymy"].

albus Author(s). Geographic distribution by major faunal realm(s): Country (province or state).

Yus albus Author(s), year: page [primary type(s) and gender(s) (deposition information); type locality (Country, Province or state: specific locality (annotation(s) such as elevation or habitat)].—Author, year: page [annotation(s)].

Yus zeus Author(s), year: page [primary type(s) and gender(s) (deposition information); type locality (Country, Province or state: specific locality (annotation(s) such as elevation or habitat)].—Author, year: page [annotation(s) such as "synonymy"].

Yus zeus.—Author(s), year: page [annotation(s) such as "generic combination"].

Within a taxon, the subordinate taxa are listed alphabetically, i.e., genera within a tribe, species within a genus.

Although this is the first treatment of the family on a worldwide basis since Wirth (1951), there are several papers that treat beach flies on a regional basis. These may be of interest and use to the reader, and a summary of these and revisionary works are provided here.

FAUNAL TREATMENTS (papers listed chronologically under major faunal realms).—Afrotropical: Frey (1958b, fauna of the Cape Verde Islands); Wirth (1960, South African fauna); Mathis and Wirth (1979, Malagasy fauna); Cogan (1980, catalog); Canzoneri (1982, fauna of Sierra Leone); Canzoneri (1987, fauna of the Sudan); Mathis (1988b, fauna of the Seychelles); Mathis and Freidberg (1991, tribe Canacini and subfamily Nocticanacinae).


Nearctic: Wheeler (1952, fauna of the United States); Wirth (1965, catalog); Cole (1969, fauna of Western North America); Wirth (1987, general description and discussion of family, key to nearctic genera).


Oriental: Delfinado (1975, Sri Lankan fauna); Delfinado and Wirth (1977, catalog).

Palearctic: Becker (1926, palearctic fauna); Séguy (1934, fauna of France); Frey (1936, 1945, 1949, 1958a, faunas of the Canary Islands, Azores, Madeira, and Canary Islands respectively); Miyagi (1963, Korean fauna); Stackelberg (1970, western palearctic fauna); Cogan (1976, checklist of the British fauna); Mathis (1982a, fauna of Israel); Mathis and Freidberg (1982, review of western palearctic species); Cogan (1984, catalog).

REVISIONARY TREATMENTS (papers listed chronologically).—Wirth (1964, Trichocanace Wirth); Wirth (1969a, Canaceoides Cresson); Wirth (1970, the snodgrassii group = Canacea Cresson); Mathis and Wirth (1978, Paracanace Mathis and Wirth); Mathis (1982a, Canace Haliday); Mathis (1982b, Isocanace Mathis); McAlpine (1982, Zale McAlpine = Zalea McAlpine, 1985); Mathis, 1989b, the texensis group of Nociticanace Malloch).

ABBREVIATIONS.—To economize on space I have used well-known acronyms for museums, especially to indicate the deposition of a primary type(s), and also for some locality data. These abbreviations are as follows:

AM Australian Museum, Sydney, Australia
AMNH American Museum of Natural History, New York, New York, USA
ANSP Academy of Natural Sciences of Philadelphia, Pennsylvania, USA
BBM Bernice P. Bishop Museum, Honolulu, Hawaii, USA
BMNH former British Museum (Natural History), collections in The Natural History Museum, London, England
CAS California Academy of Sciences, San Francisco, California, USA
DEI former Deutsches Entomologisches Institut, collections in the Institut für Pflanzenschutzforschung, Zweigstelle Eberswalde, Abteilung Taxonomie der Insekten, Eberswalde, Germany
DCSA Dipterorum Collectionis Strobl, Admont, Austria
HUS Hokkaido University, Sapporo, Japan
IOC Instituto Oswaldo Cruz, Rio de Janeiro, Brazil
LACM Los Angeles County Museum of Natural History, Los Angeles, California, USA
MCV Museo Civico di Storia Naturale de Venezia, Venice, Italy
MNHN Museum National d'Histoire Naturelle, Paris, France
MRAC Musée Royal de l'Afrique Centrale (Koninklijk Museum voor Midden-Afrika), Tervuren, Belgium
NMI National Museum of Ireland, Dublin, Ireland
NMP Natal Museum, Pietermaritzburg, South Africa
NZAC New Zealand Arthropod Collection, Entomology Division, DSIR, Auckland, New Zealand
SUJ Saikyo University, Kyoto, Japan
SMN Staatliches Museum fur Naturkunde in Stuttgart, Ludwigsburg, Germany
TMC Transvaal Museum Collection, Pretoria, South Africa
Family CANACIDAE Jones (113 species)

Canacenae Jones, 1906:170, 198 [as a subfamily of Ephydridae, incorrect formation of the family-group name]. Type genus: Canace Haliday, 1837.

Canaceidae.—Hendel, 1916:297 [incorrect formation of the family-group name].—Wirth, 1951:245-275 [revision].


Subfamily CANACINAE Jones (32 species)

As above.

Canacinae.—Hendel, 1913:93 [as a subfamily of Ephydridae, incorrect formation of the family-group name].

Canacinae.—Enderlein, 1914:326 [as a subfamily of Ephydridae].—Malloch, 1933:4 [as a subfamily of Ephydridae].—Mathis, 1982b:2 [as a subfamily of Canacidae, phylogeny].

Tribe Canacini Jones (5 species)

As above.

Canacini.—Mathis, 1982b:3 [as a tribe of Canacinae].

Genus Canace Haliday (5 species)


Ephydra (Canace).—Haliday, 1839:411.—Walker, 1853:268 [review].

actites Mathis. Palearctic: Spain (Canary and Madeira Islands).

Canace salonitana, in part (misidentification).—Wirth, 1951:264 [review, figure of σ terminalia].

Canace actites Mathis, 1982a:58 [HT USNM 76783].

Spain. Canary Islands: Teneriffe; figures of head, thorax,
nasica (Haliday). Afrotropical: Cape Verde Islands, Senegal. Palearctic: Coast of western Europe (England, France, Ireland, and Spain), Mediterranean (Egypt), and islands of eastern Atlantic Ocean (Azores, Canary Islands, and Madeira Islands).

Ephydra (Canace) nasica Haliday, 1839:411 "England."—Loew, 1860:29 [review]; 1874:80 Canace nasica.—Canace zvuv Mathis and Freidberg, 1991:73 [HT 9 (DCSA); Cameroon. Limbe (shore); figures of Q terminalia].—Mathis, 1982a:60 [discussion].—Mathis, 1982b:4-7 [review; discussion of nomenclatural status and reasons for selection of this genus-group name and author].


aldrichi (Cresson). Nearctic: USA (CA).


Canace aldrich [sic, printing error].—Wirth, 1956a:161 [discussion].

Canacea macateei. Nearctic: Canada (NB, PE), USA (Atlantic and Gulf Coasts from ME to TX). Neotropical: Belize, Guatemala (Anguilla), Cuba.


Canace snodgrassii, in part (misidentification).—Johnson, 1910:807 [list, USA (NJ)].—Wirth, 1951:260 [review, synonymy, figure of σ and Q terminalia]; 1965:733 [nearctic catalog].

Canace macateei.—Malloch, 1933:5 [note].—Curran,

**snodgrassii** (Coquillett). Neotropical: Ecuador (Galápagos Islands), Panama (Canal Area).


*Canace snodgrassii*, in part.—Wirth, 1951:260 [review, figure of σ and φ terminalia]; 1956a:161 [discussion].

*Canace snodgrassii* [sic, lapsus].—Wirth, 1956b:48 [discussion].

*Canace (Chaetocanace) biseta*.—Hennig, 1941:158 [list of types, DEI].

Genus *Canace* Wirth, in part, of authors.—Mathis and Wirth, 1979:786.

*albiceps* (Malloch). Australasian/oceanian: Australia (NSW, QLD).

*Canace albiceps* Malloch, 1925:87 [HT ♀ (AM); Australia. New South Wales: Sydney].—Wirth, 1951:262 [review].

*Isocanace albiceps* (Malloch).—Mathis, 1982b:18 [generic combination; figures of head, thorax, and σ terminalia]; 1989a:670 [Australasian/oceanian catalog].


*Xanthocanace* Hendel (10 species)


Genus *Trichocanace* Wirth (3 species)


*marksae* Wirth. Australasian/oceanian: Australia (QLD).

*Trichocanace marksae* Wirth, 1964:226 [HT σ (USNM 67134); Australia. Queensland: Cairns (bayshore); figure of σ terminalia].—Mathis, 1982b:21 [catalog, key; figures of head and thorax]; 1989a:670 [Australasian/oceanian catalog].
**nigrifrons** Malloch. Australasian/oceanian: Australia (NSW, QLD).


**orientalis** (Hendel). Oriental: China (Fukien), India (Bombay), Taiwan (Alikang, Anping), Thailand (Bangphra). *Canace orientalis* Hendel, 1913:94 [ST (14, DEI); Taiwan (Formosa, Anping)].


**ranula** (Loew). Palearctic: Belgium, Denmark, England, Germany, Ireland, Italy, Japan, Spain (Canary Islands).


**Myioblast ranula**.—Enderlein, 1935:235 [generic combination]; 1936:172 [key].

**Canace nasica** (misidentification).—Haliday, 1855:64 [review, figure of head and habitus (dorsal aspect)].

**sabroskyi** Mathis and Freidberg. Palearctic: Egypt (Sinaï).

*Xanthocanace sabroskyi* Mathis and Freidberg, 1982:100 [HT σ' (USNM 100204); Egypt. Sinaï: Nabek; figures of head, σ terminalia].

**seoulensis** Miyagi. Palearctic: Korea (Seoul).

*Xanthocanace seoulensis* Miyagi, 1963:123 [HT σ' (USNM); Korea. Seoul; figures of σ terminalia].—Mathis, 1982b:25 [catalog, key].


Subfamily *NOCTICANAClNAE* Mathis (78 species)


**Genus Canaceoides** Cresson (9 species)


*Procanace* Curran, 1934a:160. Type species: *Procanace panamensis* Curran, 1934a, by original designation; preoccupied, Hendel, 1913 (Diptera).

*Neocanace* Curran, 1934b:357. Type species: *Procanace panamensis* Curran, 1934a, automatic; new name for *Procanace* Curran, 1934.—Wirth, 1951:266 [synonymy with *Canaceoides*].

**angulatus** Wirth. Australasian/oceanian: Hawaii (Hawai'i, Kauai, Oahu). Nearctic: Mexico (BCN). Neotropical: Ecuador (Galápagos Islands), Peru (Lima).

*Canaceoides nuda* Cresson, 1926, in part (misidentification), of authors.—Bryan, 1926:69 [list]; 1934:432, 455 [list].—Hardy, 1952:466 [list].

*Canaceoides angulatus* Wirth, 1969a:556 [HT σ' (USNM 69932); Hawaii: Oahu, Waimea (intertidal rocks); figures of σ and ζ terminalia]; 1969b:590 [review]; 1975:2 [neotropical catalog].—Arnaud, 1979:346 [list, type data].—Hardy and Delfinado, 1980:384 [revision, figures of head, σ and ζ terminalia, larvae].—Mathis, 1989a:669 [Australasian/oceanian catalog].

**balboai** Wirth. Neotropical: Panama (Canal Area, Darién).

*Canaceoides balboai* Wirth, 1969a:559 [HT σ' (USNM...
Canaceoides hawaiiensis Wirth, 1969a:561 [HT cf (BBM); Hawaii. Maui, Oahu].

Genus Nocticanace Malloch (33 species)


actites Mathis and Wirth. Afrotropical: Madagascar (Tomasinia), Seychelles (Aladabra).

Nocticanace actites Mathis and Wirth, 1979:790 [HT σ* (MNHN); Madagascar. Tomasinia: Fénérerive (= Fenoanivo Atsinanana; beach); figures of σ* terminalia].—Mathis and Freidberg, 1991:76 [review].

arnaudi Wirth. Nearctic. USA (CA).


ashlocki Wirth. Neotropical: Ecuador (Galápagos Islands).

Nocticanace ashlocki Wirth, 1969b:589 [HT σ* (CAS 10160); Ecuador. Galápagos Islands: Isla Santa Cruz, Academy Bay (coastal rocks and beach); figures of wing, σ* and φ terminalia; 1975:2 [neotropical catalog].—Arnaud, 1979:347 [list, type data].

caffra Malloch (33 species)

Canaceoides caffraria (Cresson). Afrotropical: South Africa (Cape).

Canaceoides caffraria Cresson, 1934:222 [HT σ* (TMC); South Africa. Cape: East London].

Canaceoides galapagensis (misidentification).—Curio, 1964:794-797 [habits].

Nocticanace galapagensis Wirth, 1969b:583 [HT σ* (SMN); Ecuador. Galápagos Islands: Isla Wolf (from crabs);
figures of leg, $\sigma^q$ and $\varphi$ terminalia); 1975:2 [neotropical catalog].

cyclura Mathis and Wirth. Afrotropical: Madagascar (To-

laila).

Nocticanace cyclura Mathis and Wirth, 1979:791 [HT $\sigma^q$ (MNHN); Madagascar. Toliara: Sud-Est Sainte Luce, Fort Dauphin (= Taolanaro; 10 m); figures of $\sigma^q$ terminalia].—Mathis and Freidberg, 1991:77 [review].

danjoensis Miyagi. Palearctic: Japan (Kyushu).

Nocticanace danjoensis Miyagi, 1965b:302 [HT $\sigma^q$ (HUS); Japan. Kyushu: Nagasaki, Danjo Islands, Meshima; figures of $\sigma^q$ and $\varphi$ terminalia].—Cogan, 1984:125 [palearctic catalog].—Morimoto, 1989:833 [list, Japan].

darwini Wirth. Neotropical: Ecuador (Galápagos Islands).

Nocticanace darwini Wirth, 1969b:585 [HT $\sigma^q$ (SMN); Ecuador. Galápagos Islands: Isla Genovesa (on crabs); figures of leg, $\sigma^q$ and $\varphi$ terminalia]; 1975:3 [neotropical catalog].

flavipalpis Mathis and Wirth. Afrotropical: Madagascar (To-

masina), Seychelles (Aldabra, Mahé).

Nocticanace flavipalpis Mathis and Wirth, 1979:792 [HT $\sigma^q$ (MNHN); Madagascar. Toamasina: Est Ivontoka, Mananara (15 m); figures of $\sigma^q$ terminalia].—Mathis and Freidberg, 1991:77 [review].

galapagensis (Curran). Neotropical: Ecuador (Galápagos Islands).

Procanace galapagensis Curran, 1934a:160 [HT $\varphi$ (CAS 3804); Ecuador. Galápagos Islands: Albemarle Island (= Isabela), Tagus Cove].—Arnaud, 1979:348 [list, type data].

Nocticanace galapagensis.—Wirth, 1951:274 [revision, ge-
neric combination]; 1969b:581 [revision, figures of $\sigma^q$ and $\varphi$ terminalia]; 1975:3 [neotropical catalog].—Curio, 1964:794 [in part, habits].

hachijouensis Miyagi. Palearctic: Japan (Honshu).

Nocticanace hachijouensis Miyagi, 1965b:302 [HT $\sigma^q$ (HUS); Japan. Honshu: Hachijo-jima; figures of $\sigma^q$ and $\varphi$ terminalia].—Cogan, 1984:125 [palearctic catalog].—Morimoto, 1989:833 [list, Japan].

japonica Miyagi. Palearctic: Japan (Hokkaido, Honshu, Kyushu).

Nocticanace japonicus Miyagi, 1965b:300 [HT $\sigma^q$ (HUS); Japan. Hokkaido: Otaru; figures of $\sigma^q$ and $\varphi$ terminalia]; 1973d:175 [list].—Cogan, 1984:125 [palearctic catalog].—Morimoto, 1989:833 [list, Japan].

litoralis Delfinado. Oriental: Taiwan.

Nocticanace litoralis Delfinado, 1971:119 [HT $\sigma^q$ (BBM); Taiwan. Yehliu Beach, Taipei Hsien; figures of $\sigma^q$ and $\varphi$ terminalia].—Delfinado and Wirth, 1977:391 [Oriental catalog].


Nocticanace littorea Mathis and Freidberg, 1991:77 [HT $\sigma^q$ (USNM); Kenya. Takaungu (50 km N Mombasa); figure of $\sigma^q$ terminaliala].

mahensis (Lamb). Afrotropical: Seychelles (Mahé).

Canace mahensis Lamb, 1912:328 [HT $\varphi$ (BMNH); Sey-

chelles (Mahé)].

Nocticanace mahensis.—Wirth, 1951:274 [generic combi-
nation, review].—Cogan, 1980:694 [Afrotropical ca-
talog].—Mathis, 1982c:423 [revision, figures of $\sigma^q$ terminalia].—Mathis and Freidberg, 1991:78 [review].

malayensis Miyagi. Oriental: Malaysia.

Nocticanace malayensis Miyagi, 1973c:169 [HT $\sigma^q$ (HUS); Malaysia. Penang; figures of $\sigma^q$ and $\varphi$ terminalia].—Delfinado and Wirth, 1977:391 [Oriental catalog].

marshallensis Wirth. Australasian/oceanian: Marshall Is-

lands.

Nocticanace marshallensis Wirth, 1951:272 [HT $\sigma^q$ (USNM 59968); Marshall Islands. Ailinglapalap Atoll: Bigatyeiling Island; figure of $\sigma^q$ terminalia].—Arnaud, 1979:348 [list, type data].—Mathis, 1989a:669 [Australasian/oceanian catalog].

pacificus Sasakawa. Oriental: Japan (Ryukyu), Taiwan.

Palearctic: Japan (Kyushu).

Nocticanace pacificus Sasakawa, 1955:367 [HT $\sigma^q$ (SUJ); Japan. Ryukyu Islands: Tokara Islands, Nakanoshima Island; figures of $\sigma^q$ and $\varphi$ terminalia].—Miyagi, 1965b:302 [revision, figures of $\sigma^q$ and $\varphi$ terminalia]; 1973a:81 [list, Taiwan].—Delfinado and Wirth, 1977:391 [Oriental catalog].—Morimoto, 1989:833 [list, Japan].

panamensis Mathis. Neotropical: Panama (Canal Area).

Nocticanace panamensis Mathis, 1989b:599 [HT $\sigma^q$ (USNM); Panama. Canal Area: Mojinga Swamp, Ft. Sherman; figures of $\sigma^q$ terminalia].


Nocticanace peculiaris Malloch, 1933:4 [HT $\sigma^q$ (BBM); Marquesas. Eiao: Vaituha].—Wirth, 1951:270 [revision, figures of $\sigma^q$ and $\varphi$ terminalia]; 1969:391 [list, Marquesas].—Mathis, 1989a:669 [Australasian/oceanian catalog].

propristyla Miyagi. Oriental: Malaysia.

Nocticanace propristyla Miyagi, 1973c:170 [HT $\sigma^q$ (HUS); Malaysia. Port Dickson; figures of $\sigma^q$ and $\varphi$ terminalia].—Delfinado and Wirth, 1977:391 [Oriental catalog].

scapania Wirth. Neotropical: Ecuador (Galápagos Islands).

Nocticanace scapania Wirth, 1969b:586 [HT $\sigma^q$ (CAS, 10161); Ecuador. Galápagos Islands: Isla Fernandina: Punta Espinosa (inertidal rocks); figures of $\sigma^q$ and $\varphi$ terminalia]; 1975:3 [neotropical catalog].—Arnaud, 1979:348 [list, type data].

sinaensis Mathis. Palearctic: Egypt, Israel.

Nocticanace sinaensis Mathis, 1982a:64 [HT $\sigma^q$ (USNM
Genus Paracanace Mathis and Wirth (7 species)


Canace, in part, of authors.—Wirth, 1975:1 [neotropical catalog].

dicen Mathis and Wirth. Nearctic: USA (FL). Neotropical: Belize, Mexico (QNR), West Indies (Cuba, Dominica, St. Lucia, St. Vincent).

Paracanace dicen Mathis and Wirth, 1978:533 [HT σ (USNM 75304); Dominica. Calibishie; figures of wing, σ* terminalia].—Mathis, 1989b:601–603 [review].

blanoni (Wirth). Neotropical: Panama (Darién).

Canace blanoni Wirth, 1956a:162 [HT σ* (USNM 63002); Panama. Darién: Jaqué]; 1975:1 [neotropical catalog].

Paracanace blanoni.—Mathis and Wirth, 1978:524 [generic combination], 527 [key].

cavagnaroi (Wirth). Neotropical: Ecuador (Galápagos Islands).


Paracanace cavagnaroi.—Mathis and Wirth, 1978:524 [generic combination], 527 [key].

hoguei Mathis and Wirth. Neotropical: Costa Rica (Cocos Island).

Paracanace hoguei Mathis and Wirth, 1978:527 [HT σ* (LACM); Costa Rica. Cocos Island: Wafer Bay; figures of legs, wing, σ* terminalia].

lebam Mathis and Wirth. Neotropical: West Indies (Jamaica).

Paracanace lebam Mathis and Wirth, 1978:530 [HT σ* (USNM 75303); Jamaica. Runaway Bay; figures of head, σ* terminalia].—Mathis, 1989b:603 [review].

mariima (Wirth). Neotropical: Ecuador (Galápagos Islands).

Canace mariima Wirth, 1951:263 [HT σ* (USNM 59967)]; Ecuador. Galápagos Islands: Bartolomé Island (edge mangrove); figure of σ* and φ terminalia; 1975:1; 1956a: 162 [key]; 1969b:578 [review]; 1975:1 [neotropical catalog].

Paracanace mariima.—Mathis and Wirth, 1978:524 [generic combination], 527 [key].

oliveira (Wirth). Neotropical: Brazil (Rio de Janeiro).

Canace oliveira Wirth, 1956a:164. [HT σ* (IOC); Brazil. Rio de Janeiro: Ilha Guaiaba, Baia de Sepetiba]; 1975:1 [neotropical catalog].

Paracanace oliveira.—Mathis and Wirth, 1978:524 [generic combination], 527 [key].

Genus Procanace Hendel (29 species)


acuminata Hardy and Delfinado. Australasian/oceanian: Hawaii (Hawaii).

Procanace acuminata Hardy and Delfinado, 1980:389 [HT σ (BBM); Hawaii. Hawaii: east slope of Mauna Kea, Kapue Stream (1000 ft [= 300 m]); figures of wing, σ and φ terminalia].—Mathis, 1989a:669 [Australasian/oceanian catalog].

aestuaricola Miyagi. Palearctic: Japan (Shikoku).

Procanace aestuaricola Miyagi, 1965a:89 [HT σ (HUS); Japan. Shikoku: Matsuyama; figures of σ and φ terminalia].—Cogan, 1984:125 [palearctic catalog].—Morimoto, 1989:833 [list, Japan].

bifurcata Hardy and Delfinado. Australasian/oceanian: Hawaii (Oahu).

Procanace bifurcata Hardy and Delfinado, 1980:392 [HT σ (BBM); Hawaii. Oahu: Opauea Stream (1150 ft [= 350 m]); figures of σ and φ terminalia].—Mathis, 1989a:669 [Australasian/oceanian catalog].

canzonerii Mathis and Freidberg. Afrotropical: Cameroon.

Procanace canzonerii Mathis and Freidberg, 1991:79 [HT σ (USNM); Cameroon. Limbe (shore); figures of σ terminalia].

cognati Mathis. Afrotropical: Seychelles (Mahé).


confusa Hardy and Delfinado. Australasian/oceanian: Hawaii (Hawaii).

Procanace confusa Hardy and Delfinado, 1980:394 [HT σ (BBM); Hawaii. Hawaii: Akaka Falls (stream above); figures of σ and φ terminalia].—Mathis, 1989a:669 [Australasian/oceanian catalog].

constricta Hardy and Delfinado. Australasian/oceanian: Hawaii (Molokai).

Procanace constricta Hardy and Delfinado, 1980:396 [HT σ (BBM); Hawaii. Molokai: Halawa Valley (wet rocks in swift moving stream); figures of σ and φ terminalia].—Mathis, 1989a:669 [Australasian/oceanian catalog].


Procanace cressoni Wirth, 1951:256 [HT σ (BMNH); China. Fukien: Foochow (= Minhow); figures of σ terminalia].—Miyagi, 1965a:97 [revision, figures of σ and φ terminalia].—Delfinado and Wirth, 1977:392 [Oriental catalog].—Morimoto, 1989:833 [list, Japan].

diannae Mathis. Nearctic: Bermuda, USA (FL, MD, NC, SC, VA).


flavescens Miyagi. Palearctic: Japan (Kyushu).


flaviantennalis Miyagi. Oriental: Japan (Ryukyu Islands).

Procanace flaviantennalis Miyagi, 1965a:90 [HT σ (HUS); Japan. Ryukyu Islands: Ishigaki-jima; figures of σ and φ terminalia].—Morimoto, 1989:833 [list, Japan].

fulva Miyagi. Palearctic: Japan (Hokkaido, Honshu, Kyushu).


Procanace gressiti Delfinado, 1970:527 [HT σ (BBM); Papua New Guinea. NE Wonerara (1450 m); figures of σ and φ terminalia].—Mathis, 1989a:669 [Australasian/oceanian catalog].


Procanace fluvialis Canzoneri, 1987:95 [HT σ (MCV); Sudan. Khartoum (Nile River); habitus figure].—Mathis and Freidberg, 1991:83 [synonymy].

hendeli Delfinado. Oriental: Taiwan.

Procanace hendeli Delfinado, 1971:119 [HT σ (BBM); Taiwan. Wulai, Taipei Hsien (150 m); figures of φ terminalia].—Delfinado and Wirth, 1977:392 [Oriental catalog].

macquariensis Womersley. Australasian/oceanian: Macquarie Island.

Procanace macquariensis Womersley, 1937:78 [HT σ (BMNH); Macquarie Island].—Wirth, 1951:259 [review].—Mathis, 1989a:669 [Australasian/oceanian catalog].

nakazatoi Miyagi. Oriental: Japan (Ryukyu Islands).

Procanace nakazatoi Miyagi, 1965a:95 [HT σ (HUS);

Zaleinae McAlpine, 1985:81 [new name for Zalinae McAlpine, 1982]. Type genus: Zalea McAlpine, 1982 (junior homonym, Hiibner, 1818 (Lepidoptera)].

Zalea McAlpine, 1982, by original designation; preoccupied, Hübner, 1818 (Lepidoptera).


Genus Zalea McAlpine (3 species)

Zale McAlpine, 1982:116. Type genus: Zale McAlpine, 1982 (junior homonym, Hübner, 1818 (Lepidoptera)).

Subfamily ZALEINAe McAlpine (3 species)

Zalinae McAlpine, 1982:116. Type genus: Zale McAlpine, 1982 (junior homonym, Hübner, 1818 (Lepidoptera)).


Zalea McAlpine, 1985:82 [generic combination, discussion].

Zalea major McAlpine, 1982:112 [HT σ (AM); Australia. New South Wales: Bundeeena, Port Hacking; figures of head].

minor (McAlpine). Australasian/oceanian: Australia (NSW).

Zale minor McAlpine, 1982:110 [HT σ (AM); Australia. New South Wales: Sydney Harbour, Vaucluse, Nielsen Park, Bottle and Glass Rocks; figures wing, σ and ♀ terminalia].

Literature Cited

Arnaud, P.H., Jr.

Becker, T.

CoquUlett, D.W.

Canzoneri, S., and D. Meneghini

Cogan, B.H.

Cogan, B.H.

Curio, E.

Czerny, L., and P.G. Strobl

Czerny, L., and P.G. Strobl

Delfinado, M.D.

Delfinado, M.D.

Delfinado, M.D.

Delfinado, M.D., and W.W. Wirth

Enderlein, G.

Enderlein, G.

Enderlein, G.

Frey, R.

Frey, R.

Frey, R.
8(10):1-114, 4 plates, 33 figures.


Gercke, G.


Giordani Soika, A.


Goethehauer, M.


Griffiths, G.C.D.


1985. Descriptions of Figures, and References to Plates Illustrating the Notes on Kerry Insects. The Natural History Review, 2:59-64, 1 plate.

Hardy, D.E.


Harrison, R.A.


Hendel, F.


Hennig, W.


Hinton, H.E.


Johnson, C.W.


Occasional Papers of the Boston Society of Natural History, 7(15):326, 1 figure.


Jones, B.J.


Lamb, C.G.


Loew, H.


Malloch, J.R.


Mathis, W.N.


397–403, 4 figures.


Index

acutes Mathis and Canace, 7
actites Mathis and Wirth, Nocticanace, 8
acuminata Hardy and Delfinado, Procanace, 11
aestuariocata Miyagi, Procanace, 11
aecn Mathis and Wirth, Paracanace, 10
albicpes (Malloch), Isocane, 6
aldrichi (Cresson), Canacea, 4
angulus Wirth, Canaceoides, 7
arenicola Giordani Soika, Dynomiella, 5
arndti Wirth, Nocticanace, 8
ashlocki Wirth, Nocticanace, 8
atra Wirth, Trichocanace, 6
australis Mathis, Isocane, 6
balboa Wirth, Canaceoides, 7
bifurcata Hardy and Delfinado, Procanace, 11
biasta (Hendel), Chastocanacea, 5
blanxton (Wirth), Paracanace, 10
briani Mathis, Isocane, 6
brincki Delfinado, Chastocanacea, 5
caffaria (Cresson), Nocticanace, 8
cala (Cresson), Dynomiella, 5
Canace Haliday, 3
Canacea Cresson, 4
Canaceoides Jones, 3
Canacinae Jones, 3
Canalicini Jones, 3
canateri Wirth, Nocticanace, 8
canateri Mathis and Freidberg, Procanace, 11
capensis Wirth, Xanthocanace, 6
caviaroi Wirth, Paracanace, 10
Chastocanacea Hendel, 5
chilensis (Cresson), Nocticanace, 8
cogni Mathis, Procanace, 11
confusa Hardy and Delfinado, Procanace, 11
cornucopia Hardy and Delfinado, Procanace, 11
cressoni Wirth, Procanace, 11
curio Wirth, Nocticanace, 8
curini (Wirth), Canacea, 4
cyclura Mathis and Wirth, Nocticanace, 9
danjoensis Miyagi, Nocticanace, 9
darwinii Wirth, Nocticanace, 9
dianae, Mathis, Procanace, 11
Dinomia Becker, 6
Dynomiella Giordani Soika, 5
Dynomiellini Mathis, 4
flava (Canzoneri and Meneghini), Isocane, 6
flavescens Miyagi, Procanace, 11
flavipterus Mathis and Wirth, Nocticanace, 9
fluvialis Canzoneri, Procanace, 11
formostensis Miyagi, Procanace, 11
fulva Miyagi, Procanace, 11
galapagenensis (Curran), Nocticanace, 9
glanca (Wirth), Dynomiella, 5
grisetti Delfinado, Procanace, 11
grisescens Hendel, Procanace, 11
hachjiakensis Miyagi, Nocticanace, 9
hawaiianensis Wirth, Canaceoides, 8
hendeli Delfinado, Procanace, 11
hongi Wirth and Paracanace, 10
hornini (Harrison), Zalea, 12
isocana, Mathis, 5
japonica Miyagi, Nocticanace, 9
kapanorum Mathis and Freidberg, Xanthocanace, 6
lebom Mathis and Wirth, Paracanace, 10
litoralis Delfinado, Nocticanace, 9
littorea Mathis and Freidberg, Nocticanace, 9
macquariensis Womersley, Procanace, 11
macatei Malloch, Canacea, 4
magns (Hendel), Xanthocanace, 6
malhens (Lamb), Nocticanace, 9
major (McAlpine), Zalea, 12
malayanensis Miyagi, Nocticanace, 9
marina (Wirth), Paracanace, 10
markwae Wirth, Trichocanace, 6
marshallianensis Wirth, Nocticanace, 9
minor (McAlpine), Zalea, 13
miyoblaenderlein, 6
nakasatoi Miyagi, Procanace, 11
natica (Haliday), Canacea, 4
Neocanae Curran, 7
nigrifrons Malloch, Xanthocanace, 7
nigrovirescens Cresson, Procanace, 12
Nocticanace Malloch, 8
Nocicancasinam Mathis, 7
novaquinquipa, Delfinado, Procanace, 12
nudaen (Cresson), Canaceoides, 8
oliveira (Wirth), Paracanace, 10
opaca de Mejere, Procanace, 12
orientalis (Hendel), Xanthocanace, 7
pacifics Sasakawa, Nocticanace, 9
panamensis (Curran), Canaceoides, 8
panamensis Mathis, Nocticanace, 9
Paracanace Mathis and Wirth, 10
pauliani Mathis and Wirth, Procanace, 12
peculiaris Malloch, Nocticanace, 9
pninae, Mathis and Freidberg, Procanace, 12
pollinosa Miyagi, Xanthocanace, 7
procanace Curran, 7
procanace Hendel, 10
propriytya Miyagi, Nocticanace, 9
quadristosa Hardy and Delfinado, Procanace, 12
ranula (Loew), Xanthocanace, 7
rivalis Miyagi, Procanace, 12
rossi Canzoneri, Canacea, 4
saloniana variety rufatorus Strobl, Canacea, 4
sabrakshi Mathis and Freidberg, Xanthocanace, 7
saloniana Strobl, Canacea, 4
scopanua Wirth, Nocticanace, 9
scutellaris Wirth, Canaceoides, 8
seoulenis Miyagi, Xanthocanace, 7
setosus Wirth, Canaceoides, 8
sinaiensis Mathis, Nocticanace, 9
sinensis Delfinado, Nocticanace, 10
sinensis Wirth, Trichocanace, 6
spinoglossa (Coquillet), Canacea, 5
spinicosta Wirth, Nocticanace, 10
spinosa (Wirth), Dynomiella, 5
spinosa Wirth, Canaceoides, 8
sugionensis Miyagi, Procanace, 12
stuckenbergeri Mathis and Wirth, Isocane, 6
stuckenbergeri (Wirth), Dynomiella, 5
taiwanensis Delfinado, Procanace, 12
sakgitii Miyagi, Nocticanace, 10
saporose, Mathis, Nocticanace, 10
teneslilus Wirth, Canaceoides, 8
texensis (Wheeler), Nocticanace, 10
towensi Wirth, Procanace, 12
Trichocanace Wirth, 6
unguieri Wirth, Nocticanace, 10
williamsi Wirth, Procanace, 12
wirthi Mathis, Nocticanace, 10
wirthi Hardy and Delfinado, Procanace, 12
Xanthocanace Hendel, 6
Zalea McAlpine, 12
Zalea McAlpine, 12
Zalea McAlpine, 12
Zalinae McAlpine, 12
sylanciana Delfinado, Xanthocanace, 7
zimmermani Wirth, Nocticanace, 10
zww Mathis and Freidberg, Canacea, 4
REQUIREMENTS FOR SMITHSONIAN SERIES PUBLICATION

Manuscripts intended for series publication receive substantive review (conducted by their originating Smithsonian museums or offices) and are submitted to the Smithsonian Institution Press with Form SI-36, which must show the approval of the appropriate authority designated by the sponsoring organizational unit. Requests for special treatment—use of color, foldouts, case-bound covers, etc.—require, on the same form, the added approval of the sponsoring authority.

Review of manuscripts and art by the Press for requirements of series format and style, completeness and clarity of copy, and arrangement of all material, as outlined below, will govern, within the judgment of the Press, acceptance or rejection of manuscripts and art.

Copy must be prepared on typewriter or word processor, double-spaced, on one side of standard white bond paper (not erasable), with 1 1/4" margins, submitted as ribbon copy (not carbon or xerox), in loose sheets (not stapled or bound), and accompanied by original art. Minimum acceptable length is 30 pages.

Front matter (preceding the text) should include: title page with only title and author and no other information, abstract page with author, title, series, etc., following the established format; table of contents with indents reflecting the hierarchy of heads in the paper; also, foreword and/or preface, if appropriate.

First page of text should carry the title and author at the top of the page; second page should have only the author’s name and professional mailing address, to be used as an unnumbered footnote on the first page of printed text.

Center heads of whatever level should be typed with initial caps of major words, with extra space above and below the head, but no other preparation (such as all caps or underline, except for the underline necessary for generic and specific epithets). Run-in paragraph heads should use period/dashes or colons as necessary.

Tabulations within text (lists of data, often in parallel columns) can be typed on the text page where they occur, but they should not contain rules or numbered table captions.

Formal tables (numbered, with captions, boxheads, stubs, rules) should be submitted as carefully typed, double-spaced copy separate from the text; they will be typeset unless otherwise requested. If camera-copy use is anticipated, do not draw rules on manuscript copy.

Taxonomic keys in natural history papers should use the aligned-couplet form for zoology and may use the multi-level indent form for botany. If cross referencing is required between key and text, do not include page references within the key, but number the keyed-out taxa, using the same numbers with their corresponding heads in the text.

Synonymy in zoology must use the short form (taxon, author, year:page), with full reference at the end of the paper under "Literature Cited." For botany, the long form (taxon, author, abbreviated journal or book title, volume, page, year, with no reference in "Literature Cited") is optional.

Text-reference system (author, year:page used within the text, with full citation in "Literature Cited" at the end of the text) must be used in place of bibliographic footnotes in all Contributions Series and is strongly recommended in the Studies Series: "(Jones. 1910:122)" or "... Jones (1910:122)." If bibliographic footnotes are required, use the short form (author, brief title, page) with the full citation in the bibliography.

Footnotes, when few in number, whether annotative or bibliographic, should be typed on separate sheets and inserted immediately after the text pages on which the references occur. Extensive notes must be gathered together and placed at the end of the text in a notes section.

Bibliography, depending upon use, is termed “Literature Cited,” "References," or "Bibliography." Spell out titles of books, articles, journals, and monographic series. For book and article titles use sentence-style capitalization according to the rules of the language employed (exception: capitalize all major words in English). For journal and series titles, capitalize the initial word and all subsequent words except articles, conjunctions, and prepositions. Transliterate languages that use a non-Roman alphabet according to the Library of Congress system. Underline (for italics) titles of journals and series and titles of books that are not part of a series. Use the parentheses/colon system for volume (number); pagination: "10(2):5-9." For alignment and arrangement of elements, follow the format of recent publications in the series for which the manuscript is intended. Guidelines for preparing bibliography may be secured from Series Section, SI Press.

Legends for illustrations must be submitted at the end of the manuscript, with as many legends typed, double-spaced, to a page as convenient.

Illustrations must be submitted as original art (not copies) accompanying, but separate from, the manuscript. Guidelines for preparing art may be secured from Series Section, SI Press. All types of illustrations (photographs, line drawings, maps, etc.) may be intermixed throughout the printed text. They should be termed Figures and should be numbered consecutively as they will appear in the monograph. If several illustrations are treated as components of a single composite figure, they should be designated by lowercase italic letters on the illustration; also, in the legend and in text references the italic letters (underlined in copy) should be used: "Figure 9b." Illustrations that are intended to follow the printed text may be termed Plates, and any components should be similarly lettered and referenced: "Plate 9b." Keys to any symbols within an illustration should appear on the art rather than in the legend.

Some points of style: Do not use periods after such abbreviations as "mm, ft, USNM, NNE." Spell out numbers "one" through "nine" in expository text, but use digits in all other cases if possible. Use of the metric system of measurement is preferable; where use of the English system is unavoidable, supply metric equivalents in parentheses. Use the decimal system for precise measurements and relationships, common fractions for approximations. Use day/month/year sequence for dates: "9 April 1976." For months in tabular listings or data sections, use three-letter abbreviations with no periods: "Jan, Mar, Jun," etc. Omit space between initials of a personal name: "J.B. Jones."

Arrange and paginate sequentially every sheet of manuscript in the following order: (1) title page, (2) abstract, (3) contents, (4) foreword and/or preface, (5) text, (6) appendices, (7) notes section, (8) glossary, (9) bibliography, (10) legends, (11) tables. Index copy may be submitted at page proof stage, but plans for an index should be indicated when manuscript is submitted.