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STUDIES ON
MARINE OSTRACODS

PART II

External Morphology of the
Genus *Cythereis* with Descriptions
of twenty-one New Species

BY

TAGE SKOGSBERG

Hopkins Marine Station, Pacific Grove, California

SAN FRANCISCO

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CONTENTS

	PAGE
Preface.....	5
Genus <i>Cythereis</i>	7
Subgenus <i>Procythereis</i>	17
Torquata group.....	19
<i>Cythereis torquata</i>	19
<i>Cythereis iganderssoni</i>	24
<i>Cythereis robusta</i>	27
Radiata group.....	30
<i>Cythereis radiata</i>	30
<i>Cythereis polita</i>	35
Subgenus <i>Cythereis</i>	38
Montereyensis group.....	56
<i>Cythereis montereyensis</i>	56
<i>Cythereis pacifica</i>	68
Taniata group.....	72
<i>Cythereis taniata</i>	72
<i>Cythereis taniata</i> var. <i>deliciosa</i>	77
<i>Cythereis longiductus</i>	78
Discophora group.....	83
<i>Cythereis discophora</i>	83
<i>Cythereis mesodiscus</i>	87
<i>Cythereis megalodiscus</i>	90
Frequens group.....	95
<i>Cythereis frequens</i>	95
Ehippiata group.....	100
<i>Cythereis ehippiata</i>	100
<i>Cythereis théeli</i>	106
<i>Cythereis recurvirostra</i>	108
Glauca group.....	110
<i>Cythereis glauca</i>	110
<i>Cythereis platycopa</i>	116
<i>Cythereis aurita</i>	120
Subgenus <i>Pseudocythereis</i>	126
<i>Cythereis spinifera</i>	130
<i>Cythereis falcata</i>	137
Literature cited.....	143
Abbreviations.....	143
Illustrations of species.....	Plates I-VI 144

STUDIES ON MARINE OSTRACODS, PART IIEXTERNAL MORPHOLOGY OF THE
GENUS CYTHEREIS, WITH DESCRIPTIONS
OF TWENTY-ONE NEW SPECIES

BY

TAGE SKOGSBERG

Hopkins Marine Station, Pacific Grove, California

PREFACE

When, in 1920, my "Studies on Marine Ostracods" was in the press, there were fairly strong reasons to suppose that my investigations of the marine Ostracods would be continued. So, "Part I" was added to the title of the paper. Many scientific treatises with this appendage to their titles stand as the lone representatives of series planned and hoped for by their optimistic authors; only to show how frequently aspirations in the field of science are shattered by unforeseen circumstances. "Ut desint vires, tamen est laudanda voluntas" . . . Mine is another example of this recurrent necessity to desert early aspirations for new fields of activity.

Shortly after the publication of the paper mentioned above, I was granted a traveling scholarship from the C. F. Liljewalch's Fund (of the University of Uppsala, Sweden) to continue, for a period of six months, my studies at the Hopkins Marine Station of Stanford University, Pacific Grove, California. Monterey Bay, on which the Hopkins Marine Station is located, is very rich in Ostracods, as well as in marine life generally. Indeed, it is undoubtedly one of the richest collecting places to be found in the proximity of a scientific institution. I collected in this bay a large number of species of Ostracods, nearly all of which were new to science. However, when, at the end of the stipulated six months, I determined to remain on the west coast of America, it became necessary for me to take up new lines of research. During the last five years I have been working largely on problems bearing on

commercial fisheries and on the marine dinoflagellates. Meanwhile my studies on the Ostracods had to be discontinued. When at this late date "Part II" of my "Studies" appears, it has not the form originally planned. It is, on the contrary, but a part of a fairly large monographic treatment of the sub-order *Podocopa*, extracted in order to preserve at least some of my results.

This paper contains an account of the external morphology of the genus *Cythereis* and the descriptions and the classification of some new species of this genus. General discussions have been postponed to a future contribution which I still hope to be able to issue.

Five of the twenty-one new species described in this paper were taken at or near Pacific Grove, California, and were examined and described at the Hopkins Marine Station. The remaining species were taken in the Antarctic regions either by the Swedish Magellan Expedition, 1896, or by the Swedish Antarctic Expedition, 1901-03. The Antarctic material was treated largely at the Swedish State Museum at Stockholm, where, due to the kind interest of Professor H. Théel of that Institution, a skilful artist, Mr. G. Liljevall, was placed at my disposal. Mr. Liljevall is responsible for most of the figures of the plates appended to this paper. All the text figures were drawn by the author.

A part of the material on which this paper is based is deposited with the Swedish National Museum (Riksmuseum), Stockholm, part in the Museum of the California Academy of Sciences.

It is a pleasure to use this opportunity to thank the following men for their help in the preparation of this work: Professor H. Théel (for whom *Cythereis thééli* is named), Professor T. Odhner, and Dr. N. Odhner, of the Swedish State Museum, Stockholm; Mr. G. Liljevall, also attached to that institution; and Professor W. K. Fisher, the Director of the Hopkins Marine Station, Pacific Grove.

*Hopkins Marine Station of Stanford University,
Pacific Grove, California, November, 1926.*

Family CYTHERIDÆ Baird (1850)

Subfamily Cytherinæ G. O. Sars (1925)

Genus **Cythereis** (T. R. Jones, 1849) Baird (1850)

DIAGNOSIS

Shell: Thick, with strong calcareous incrustation; surface frequently with more or less elaborate sculpture; sculpture as well as shape of shell highly variable. Muscle spots hard to detect, usually rather numerous, apparently always more than four. Inner line at a moderate distance from and subparallel to margin of shell; line of concrescence ("Verwachsungslinie") either coincides entirely with inner line, or these lines are separated only along a short distance inside anterior margin of shell. Marginal pores frequently numerous, especially anteriorly and antero-ventrally where they are very closely set; all or nearly all simple, and most of them somewhat widened either near their middle or near margin of shell. Selvage narrow or of moderate width, hard to detect. Hinge with two strong terminal teeth on right valve, one anterior and one posterior, and with one strong tooth on left valve located just behind anterior tooth of right valve; teeth fit into sockets on opposite valves; between teeth usually a more or less developed ridge fitting into a groove on opposite valve. Eyes usually present, composed of two portions which may be lodged in special cavities of the shell.

First antenna: Fairly strong, either five- or six-jointed; second joint with one bristle, postero-distal in position; third joint with one bristle, antero-distal in position; all bristles of moderate length to rather short, at least four of those on the three to four distal joints strong and claw-like.

Second antenna: Strong and four-jointed (one protopodite joint and three endopodite joints); exopodite sometimes well-developed in both sexes, sometimes well developed in ♂, but reduced in ♀, sometimes reduced in both sexes; first endopodite joint with one bristle; second endopodite joint, besides postero-distal bristles, with two bristles on anterior side and three on posterior side; distal joint with three claw-like bristles.

Mandible: With a strong, toothed masticatory process; and with a comparatively large palp, the three proximal joints of which may be completely merged; distal joint at least twice as long as its basal height. On ventral side of first and second endopodite joints, there are three long, thick, and curved bristles, each furnished with two longitudinal rows of fairly long hairs; these bristles at least as long as total dorsal length of first and second endopodite joints. Second endopodite joint with eight dorso-distal bristles, most of which are placed on a verruciform process.

Maxilla: Epipodial appendage rather large, with about 16 bristles; at base of its dorso-anterior bristle, there is a rather small, rounded, lobe-like projection with a dense coat of rather long hairs; no bristles of this appendage directed toward the mouth and none is "aberrant." With three well developed endites, at most about twice as long as high, each with about seven or eight distal bristles. Endopodite two-jointed, proximal joint rather large, distal joint small.

Fifth, sixth, and seventh limbs: Long and slender, but at the same time rather powerful; four-jointed, all joints well separated and differentiated; always with a postero-proximal bristle on the protopodite and with a ventero-distal bristle on the first exopodite joint; fifth limb with two bristles at knee, sixth and seventh with but one at corresponding place; proximally to knee, anterior side of protopodite has two bristles, the proximal of which may be vestigial in seventh limb.

Furca: Small, with two to three rather short bristles.

Almost exclusively marine, occurring all over the world and at all depths.

REMARKS

In examining a fairly large number of species and genera of the suborder *Podocopa*, I established two fundamental facts. First, generally speaking, most organs are subject to but slight variations within each genus. Second, when variations do occur, they are not limited to one or a few organs, but different organs vary in different species. In order to avoid too much repetition in the descriptions of the species under these circumstances, it seemed best to adopt the principle applied to

the genus *Conchoecia* in my "Studies on Marine Ostracods, Part I," 1920; i.e., to present in the descriptions of the genera and subgenera what might be termed the "normal types" of the various organs. When a character is not noted in the description of a species, it thus means that in this species the character in question agrees with the "normal type" of the genus or subgenus. In most genera it is sufficient to give figures of all the organs in the case of one species only. The descriptions of the remaining species can conveniently be made in the form of comparisons with this representative form. In my presentation of the genus *Cythereis*, *Cythereis* (*Cythereis*) *montereyensis* sp. nov. was chosen as the typical representative.

It should be noted that for practical reasons the directions of the parts of the various organs, as given in this paper, always refer to the organs as they appear under the cover-glass.

Cythereis was established as a subgenus by T. R. Jones in his "Monograph of the Entomostraca of the Cretaceous Formation of England," 1849. It was thus originally founded exclusively on the shells of fossil forms. According to Jones, this subgenus would differ from the genus *Cythere* mainly in the following respects: The shell has an "almost regularly oblong shape," while in *Cythere* it is "irregularly oval and gibbous." However, even though the dorsal and ventral margins tend to be sub-parallel, the dorsal margin has a posterior slope. "The superior border, however, especially in the left (larger) valve, trends upwards as it approaches its anterior extremity, making at its junction with the anterior border a more acute angle than that formed by the junction of the anterior and ventral borders, and thereby leaving a greater space between the anterior hinge and the ventral margin than between the same margin and the posterior hinge." It thus appears to be rather the straight course of the dorsal margin than the sub-parallelism of the dorsal and ventral margins that Jones considered to be important. With regard to the sculpture of the surface of the shell, Jones writes as follows: "On the valves three eminences or tubercles are more or less strongly developed; one rather anterior to the centre, which is very characteristic of this section . . . and one at each angle formed by the junction of the posterior with the superior

and inferior borders. From each of these last-mentioned tubercles a ridge generally arises, which is continued more or less uninterruptedly around the edge of the valve."

The species included by Jones in the subgenus *Cythereis* are very different from each other and, taken as a whole, do not well agree with the characterization of the subgenus. Thus while in *Cythereis quadrilatera*, *C. ciliata*, and *C. cornuta*, the dorsal and ventral margins are sub-parallel, in *C. triplicata* the dorsal margin slopes so abruptly posteriorly that the posterior margin is nearly suppressed. Also the shape of the dorsal margin is distinctly variable. In regard to the sculpture of the surface of the shell, Jones's species also exhibit striking differences. In *C. interrupta* the surface is nearly smooth, "pitted like the surface of a thimble" and without or with but slightly developed ridges. In *C. gaultina* "the whole surface of the valve exhibits a beautiful arrangement of slightly raised network." In *C. ciliata* the surface is covered with granulations and spines and has a strongly developed central tubercle and great keels.

The question as to whether all the species included by Jones in *Cythereis* belong to one natural systematic unit can not be settled as yet but probably has to be answered in the negative. Furthermore, it does not seem advisable at this time to select any one of the forms described by him as the type of this unit. An extensive study of recent forms and a careful comparison between these and Jones's species ought to precede this choice.

W. Baird ("Natural History of the British Entomostraca," 1850), who was the next to treat *Cythereis*, elevated this subgenus to generic status and gave it the following diagnosis: "Animal unknown. Carapace valves or shell of an almost regular oblong shape, the dorsal and ventral margins lying nearly parallel to each other. Surface of a very irregular appearance, being wrinkled, ridged, and beset with tubercles, and crenulated or strongly toothed on the margins." Baird thus places emphasis on the roughness of the surface of the shell.

G. O. Sars, 1865, who was the first to examine the appendages of recent members of this genus, emphasized the same characteristics of the shell as did Baird. In regard to the appendages the following characteristics were given by this investigator: The first antennæ are "vero sæpius distincte 6

articulatæ." In the adult females the exopodites of the second antennæ are "brevisimo et obtuso instructæ." The palp of the mandible is elongated, curved, and distinctly four-jointed; the distal joint is long and narrow. The first endopodite joint has two, the second endopodite joint has one, long, curved ventral bristles furnished with hairs. The epipodial appendage has five bristles of which two are short. In the epipodial appendage of the maxilla, one bristle is situated somewhat apart from the remaining ones. The furca has two or three bristles. This diagnosis evidently agrees more closely with my diagnosis of the subgenus *Pseudocythereis* than with my diagnosis of the subgenus *Cythereis*. Especially noteworthy in this connection is the number of bristles of the epipodial appendage of the mandible. Also, the first antenna is described as six-jointed. In regard to the latter character, however, it should be noted that not fewer than four of Sars's twelve species had five joints in this appendage (*Cythereis villosa*, *emarginata*, *angulata*, and *abyssicola*).

In his "Monograph of the Recent British Ostracoda," 1868. G. S. Brady rejects the genus *Cythereis* and joins it with the genus *Cythere*. This investigator writes as follows: "In the first place the characters taken by that author [G. O. Sars] as the ground of generic distinction seem to me inadequate; secondly, four of our British species, *C. albomaculata*, *convexa*, *rubida*, and *pulchella*, present intermediate characters, and could not be included under either of the genera as defined by Sars. . . . If the characters here ascribed to *Cythereis* could have been found to be uniformly coincident with the quadrangular and rugose forms of carapace for which the genus *Cythereis* was originally proposed, or even if they could have been applied with precision to any group, without respect to shell-structure, they might perhaps, though dubiously, have been allowed to form the basis of a distinct genus; but seeing that we have forms distinctly partaking of the characters of both genera, there seems no reasonable course but that of uniting the two under one name." *Cythereis albomaculata* would have the shell and the exopodite of the second antenna similar to the genus *Cythere*, but its mandible and furca would agree with *Cythereis*. *Cythereis convexa* would resemble *Cythere* in the case of the shell and *Cythereis* in the second antenna and

the mandible. *Cythereis rubida* approaches *Cythere* in the shape and structure of the shell, while all its appendages agree with *Cythereis*. *Cythere pulchella* is too incompletely known to be considered in this connection. The outline of its shell recalls the genus *Cythereis*; the exopodite of the second antenna is well developed in males and females. Also in his later papers (e.g., in his monograph of the Ostracods collected by the Challenger Expedition), Brady maintains this attitude.

In the present paper I have adopted G. W. Müller's (1894) decision that the genus *Cythereis* ought to be maintained, and that it is not even very closely related to the genus *Cythere*. Indeed, it is structurally closer to the genus *Cytherideis* Jones than to *Cythere*. The only thing demonstrated by G. S. Brady's criticism is that the shape and structure of the shell and the development of the exopodite of the second antenna are not characteristic of the genus *Cythereis*. In the case of other structural features, e.g., of the mandible, no intermediate forms are known to occur. The structure of the mandible is, indeed, the most characteristic feature of the genus *Cythereis*. It is a peculiar fact that this characteristic has been overlooked by so careful a worker as G. O. Sars who in his latest paper (1925) assigns a typical member of the genus *Cythereis*, viz., *C. albomaculata* (Baird), to the genus *Cythere* and omits the structure of the mandibular palp from the diagnosis of the latter genus.

The genus *Trachyleberis* established by G. O. Brady, 1898 (p. 444), undoubtedly is referable to the genus *Cythereis*, as conceived by G. W. Müller and me; compare G. W. Müller, 1912, page 336. On the other hand, I am not able to follow G. W. Müller (1912, p. 336) when he includes the genus *Cytheridella* (Daday, 1905, p. 261) in *Cythereis*. *Cytheridella* differs so profoundly from *Cythereis* in most respects that even a close relationship between these two genera appears very questionable.

There is a possibility that some of the species described as new in the present paper have been established previously. The reasons for this uncertainty are that G. S. Brady has established a fairly large number of species of the genus "*Cythere*" based on material from the Tierra del Fuego and from the Falkland Islands, i.e., from two of my most important locali-

ties; and that these species are described and figured so superficially that their certain identifications are excluded at the present time. If Brady's type material still exists, some of his species might be found to be identical with some of mine. However, until a reexamination of these forms of Brady has been carried out, it does not appear to be advisable to attempt their identification.

The species of Brady referred to in the last paragraph are as follows:

From **Tierra del Fuego**:

Cythere contracta G. S. Brady, 1870, p. 201, Pl. XXVII, figs. 5, 6. This has the outline of the shell similar to that of *Cythereis (Cythereis) mesodiscus*, but the surface appears to lack pronounced structural differentiation. It is classified by G. W. Müller (1912) under the heading "Cytheridarum genera dubia et species dubiae." Many species have about the same outline of shell.

Cythere convexa var. *meridionalis* G. S. Brady, 1870, p. 234, Pl. XXX, figs. 11-13. In this species the outline of the shell recalls *Cythereis (Procythereis) radiata*. The agreement is, however, not complete, and the structure of the surface is uncertain. G. W. Müller (1912) writes this name as a possible synonym of *Cythereis convexa*. A fairly large number of species have the same outline of shell as this form.

Cythere cuboidea G. S. Brady, 1870, p. 201, Pl. XXVII, figs. 13, 14. This species does not show any distinct resemblance to any of my species of *Cythereis*. It is classified by G. W. Müller (1912) under "Cytheridarum genera dubia et species dubiae."

Cythere magellanica G. S. Brady, 1870, p. 201, Pl. XXVII, figs. 19-22. Of this species Brady figures two specimens, the male and the female. The male (figs. 19, 20) recalls *Cythereis (Cythereis) recurvirostra*; the female (figs. 21, 22), *Cythereis (Procythereis) iganderssoni*. In all probability Brady has mixed two species. The similarities are not striking enough to justify identification. G. W. Müller (1912) records this form under "Cytheridarum genera dubia et species dubiae."

Cythere margollei G. S. Brady, 1870, p. 200. Of this species not even the shell is figured; and so I refrain from any sug-

gestions as to its relationships. Regarded by G. W. Müller (1912) as an uncertain member of *Cythereis*.

Cythere propinqua G. S. Brady, 1870, p. 233, Pl. XXX, figs. 6, 7. This form does not show any distinct similarity with any of my species. The outline of the shell approximates the one characteristic of the species of the *Discophora* group. Recorded by G. W. Müller (1912) among the "Cytheridarum genera dubia et species dubiae."

Cythere reussi G. S. Brady, 1870, p. 153, Pl. XVIII, figs. 9, 10; 1880, p. 74, Pl. XIV, fig. 2. Undoubtedly based on two different species. Neither of them resembles any of the forms described by me. Regarded by G. W. Müller (1912) as an uncertain member of *Cythereis*.

Cythere shorelli (according to G. W. Müller, 1912, a lapsus pennæ for *thorelli*) G. S. Brady, 1870, p. 234, Pl. XXX, figs. 14, 15. Recalls somewhat *Cythereis* (*Cythereis*) *mesodiscus*, but is distinctly higher relatively. Classified as an uncertain member of the genus *Cythereis* by G. W. Müller (1912).

Cythere subquadrata G. S. Brady, 1870, p. 233, Pl. XXX, figs. 8-10. The outline of the shell seen laterally, but not from below, recalls the members of the *Ephippiata* group. The surface of the shell, however, appears to lack distinct areolation. G. W. Müller (1912) puts it under the heading "Cytheridarum genera dubia et species dubiae."

Cythere zurcheri G. S. Brady, 1870, p. 200. Of this species no parts are figured, and so no suggestions are ventured. Regarded by G. W. Müller (1912) as an uncertain member of *Cythereis*.

Cythere scintillulata G. S. Brady, 1880, p. 62, Pl. XIV, fig. 3. Does not at all resemble any of the species established by me. Classified by G. W. Müller (1912) as uncertain to genus as well as to species.

From the **Falkland Islands:**

Cythere falklandi G. S. Brady, 1880, p. 65, Pl. XII, fig. 6. Does not show any similarity to any of the species described in the present paper. Considered to be uncertain to genus as well as to species by G. W. Müller (1912).

Cythere fulvotincta G. S. Brady, 1880, p. 67, Pl. XIV, fig. 5. Does not resemble any of my species. According to G. W. Müller (1912) of the same status as *C. falklandi*.

Cythere impluta G. S. Brady, 1880, p. 76, Pl. XVI, fig. 3, Pl. 26, fig. 6. Two distinct species. See remarks under *Cythereis* (*Cythercis*) *théeli*. An uncertain member of *Cythereis*, according to G. W. Müller (1912).

Cythere mosleyi G. S. Brady, 1880, p. 64, Pl. XII, fig. 5. Does not resemble any of my species. Uncertain to genus and species, according to G. W. Müller (1912).

As will be seen from the above summary, some of my species resemble forms previously taken at the same locality, while the majority do not. G. S. Brady has established a great many more species of "*Cythere*" from other localities, described and figured just as superficially as those discussed above. Of course, there is a possibility that some of these are identical with some of mine. However, the probability is fairly small. Generally speaking, the great majority of the species of this multiform genus are described so unsatisfactorily that certain identification can not be made. A fundamental revision of this genus must necessarily be carried out before the development of our knowledge in this field can proceed on a firm basis.

The first attempt at a subdivision of this genus was carried out by G. W. Müller (1894), who established three groups of species on the basis of the structure of the surface of the shell. The first group is characterized by having pits on the surface of the shell but no processes on the ribs and no distinct longitudinal ribs. Furthermore, the females of the members of this group have the exopodite of the second antenna short. In all probability the first antenna is five-jointed (figured for one species only, viz., *Cythereis convexa*). Thus the species of this genus belong to the subgenus *Cythereis*. In the second group the ribs separating the pits have knob-like processes. In other respects the shell should have the same characteristics as in the first group. Only two species are assigned to this group. Although these show a certain similarity in the structure of the shell, their penes are so different that a close relationship appears improbable. At least in one of the two species the first antenna is six-jointed. The exopodite of the second antenna is reduced in size in the males, which indicates that these species do not belong to any of the three subgenera

established in the present paper. The third, and last, group is characterized by having "not more than four longitudinal ribs" on the shells; besides these, the shell may have pits and processes, or it may be smooth. This group, which comprises six species, appears to be distinctly heterogeneous. The development of the exopodite of the second antenna is variable. The first antenna appears always to be six-jointed. Besides members of these three groups, G. W. Müller found four species, viz., *Cythereis prava*, *lineata*, *dentata*, and *teres*, which do not approach any of the groups but occupy a more or less isolated position. Of these species, *C. dentata* appears to be fairly closely related to *C. falcata*, judging by the structure of the penis.

A subdivision of the genus *Cythereis* on the basis of the shape and structure of the shell is, generally speaking, impossible. The best illustration of this statement is afforded by my subgenus *Procythereis*; compare, for instance, *Cythereis (Procythereis) iganderssoni* with its heavily developed ventral main ridge and heavy reticulation, and *C. (P.) polita*, which almost completely lacks main ridges and the surface of which is nearly smooth, being ornated only with minute pits. The subdivisions must, on the contrary, be based on the structure of the appendages and of the penis. Especially the structure of the penis appears to be significant. Indeed, just as in several other groups of Arthropods, this organ appears to have been the seat of the initial morphological changes leading to speciation. Unfortunately, the morphological interpretation of the structural complexities of this organ is still uncertain. To carry out the homologies of its different parts will probably prove the most fascinating and fruitful morphological problem that the Ostracod group has to offer.

It has not appeared advisable to attempt at the present time a classification of the species of this genus described in previous papers. Nearly all of these species, even those treated by G. W. Müller, are described too superficially to allow a well-founded opinion about their morphological and evolutionary relationships. As I have noted at another place in this section, a thorough revision of the members of this genus is imperative.

Subgenus Procythereis, new subgenus

Description:

Shell: With the same characteristics as in the subgenus *Cythereis*.

First antenna: Without sex dimorphism. The normal type is about the same as in the subgenus *Cythereis*; with five joints. Length of fourth joint rather variable; within each species, however, fairly constant. (With regard to the measurements of the length of this joint given in the descriptions of species, see the footnote under the description of this appendage in the subgenus *Cythereis*.) The most striking differences from the normal type of the subgenus *Cythereis* are found in the short latero-distal claw of the fourth joint. This claw points in about the same direction as the distal joint and is relatively long, being in most cases about as long as the distal joint, or but slightly shorter (text fig. II, 3 of *C. [Procythereis] iganderssoni*). The relative lengths and the types of the remaining bristles are about the same as in the subgenus *Cythereis*. A small spine is usually found at the bases of the narrow bristles issuing in front of the two long claws of the fourth joint. The pilosity is about the same as in the subgenus *Cythereis*. The hairs on the two distal joints, however, seem in most cases to be rather weakly developed.

Second antenna: Without or with fairly slight sex dimorphism. The normal type is about the same as in the subgenus *Cythereis*, but the exopodite of the female is of approximately the same size and shape as in the male.

Mandible: Without or with very slight sex dimorphism. The normal type is very similar to that of the subgenus *Cythereis*. The following differences are, however, characteristic of the species described in this paper. Masticatory joint: The next to the anterior tooth, which is single or paired in the subgenus *Cythereis*, seems always to be paired. Fifth pair of teeth small and in most cases represented by a single tooth. Behind the fifth pair of teeth follow a bifurcate, peg-like tooth; a narrow, weak, simple or slightly bifurcate tooth, sometimes almost absent; and a short bristle. The notch at about the middle of the posterior side of this joint is usually less developed than in the subgenus *Cythereis*; and there is no

rounded hump on the anterior side of the dorsal part of this joint. Epipodial appendage: This has two long bristles with long, fine hairs; furthermore, the vestigial bristle and the peg-like appendage are furnished with long hairs. Second endopodite joint: Of the two dorso-distal bristles which are short in the subgenus *Cythereis*, one is rather long in *Procythereis*, being about twice as long as in *C. (Cythereis) montereyensis*; the other usually a little longer than the end joint. These two bristles are usually non-annulated, and furnished with short, fine hairs or nearly naked. The two ventral bristles of this joint are situated somewhat more distally than in figure 9 of *C. (Cythereis) montereyensis*. On the inner side of the second protopodite joint, somewhat dorsally to the middle of the joint, there is, as a rule, a group of hairs.

Maxilla: This shows no sex dimorphism. The normal type is very similar to that of the subgenus *Cythereis*. The following differences are found in the species described in this paper. First endite: The rather strong bifurcate bristle in figure 13 of *C. (Cythereis) montereyensis* is usually furnished with several fairly long and rather powerful spines. Second endite: One bristle with long hairs, and seven with fine and more or less short ones. Third endite: Two bristles with numerous long hairs, four with short, fine hairs, and one with fairly strong spines. Palp: All the four dorso-distal bristles of the first joint are annulated; the three short ones with short hairs or hairs of moderate length; the long one in most cases with hairs of moderate length. On the lateral side of this joint there is a longitudinal, usually dense, row of fine hairs.

Fifth limb: Without or with rather slight sex dimorphism. Normal type: Similar to that of the subgenus *Cythereis*, but the shorter of the two bristles at about the middle of the anterior side of the protopodite is situated somewhat, though rather little, proximally to the other.

Sixth and seventh limbs: About the same as in the subgenus *Cythereis*. However, the short hairs on the outside of the protopodite seem to be absent or very slightly developed.

The chitinous support of the last three appendages, developed on the sides of the body, resembles in the main that in the subgenus *Cythereis*. It shows, however, rather great vari-

ations, even within the species, and seems not to be convenient to use in distinguishing the species.

Brush-shaped organ: About as in the subgenus *Cythereis*.

Penis: Of about the same fundamental type as in the subgenus *Cythereis*. A detailed description may conveniently be postponed.

The furca of the male and female, and the posterior part of the female body approximately as in the subgenus *Cythereis*. In the species examined by me, no transverse rows of spines were found near the bristle on the posterior extremity of the female body.

Lips: About the same as in the subgenus *Cythereis*. In the species described in this paper the A-shaped chitinous support above the upper lip has no cross-bar. The dorso-medial of the pairs of chitinous strips of the upper lip seems to be absent or is very weak.

The color of the chitin is about the same as in the subgenus *Cythereis*.

The type species of this subgenus is *Cythereis (Procythereis) torquata*.

Arrangement of the species: This subgenus may conveniently be divided into two groups, characterized by the shape and structure of the penis and by the course of the ductus in the genital verruca of the female. These two groups may be called the *Torquata* Group and the *Radiata* Group.

Torquata Group nov.

Cythereis (Procythereis) torquata and *iganderssoni*, and presumably also *C. (P.) robusta*, belong to this group.

C. (*Procythereis*) *torquata*, new species

Plate I, fig. 1; Plate IV, fig. 2; text fig. I.

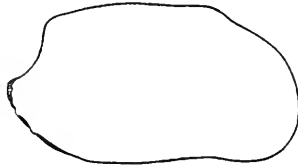
Description: Male—

Shell: The shells of the males examined by me unfortunately were broken. I am thus unable to give a description of them. However, judging by the fragments, the male shell has about the same shape as that of the female and the same characteristic sculpture of the surface.

First antenna: Relatively elongated; somewhat more slender than in *C. (Cythereis) montereyensis*. Proportions of the lengths of the joints about as follows:

$$\text{I. } \frac{14}{17} \quad \text{II. } \frac{13}{9} \quad \text{III. } \frac{4}{4.5-5.0} \quad \text{IV. } \frac{11.5}{10.5} \quad \text{V. } \frac{3.5}{4}$$

Third joint: Claw rather weak, its tip reaching to or slightly beyond point of attachment of proximal claw of fourth joint. Fourth joint: Proximal claw usually somewhat weaker than in text fig. VI, 5 of *C. (Cythereis) montereyensis*; almost straight, and generally slightly longer than posterior side of second joint. The narrow bristle in front of



Text fig. I. *Cythereis (Procythereis) torquata* n. sp., ♀, not type.

Right valve from the side. Tierra del Fuego, Cape Valenty. $\times 39$.

this claw is in most cases somewhat shorter than the claw, its length somewhat variable. The long distal claw of this joint about as long as posterior side of second joint and somewhat more than twice as long as distal joint, its type about same as in *C. (Cythereis) montereyensis*. The short latero-distal claw of this joint about as long as, or slightly shorter than distal joint and about as strong as bristle of second joint or slightly weaker. Distal joint: Claw about as long as long distal claw of fourth joint. Proportions of other bristles of this antenna about same as in text fig. VI, 5 of *C. (Cythereis) montereyensis*. Pilosity: A longitudinal, sometimes somewhat irregular, row of hairs of different lengths on both medial and lateral sides of first joint; hairs on anterior side of second joint scarcer than in *C. (Cythereis) montereyensis*, distal ones fairly long; hairs of the two distal joints very slightly developed, distal part of fourth joint and distal joint being practically naked.

Second antenna: Type of protopodite and endopodite, and positions of bristles about same as in Plate XXXV, fig. 19,

G. W. Müller, 1894. Bristle of first endopodite joint often slightly weaker and shorter than in *C. (Cythereis) montereyensis*. Medial one of the three bristles at about middle of posterior side of second endopodite joint slightly shorter, the posterolateral one slightly longer than in text fig. VII, 8 of the mentioned species; pectination of these two bristles of moderate strength or fairly weak. Proportions of the three end claws about same as in the mentioned figure, or the proximo-lateral one slightly shorter and weaker than proximo-medial one; pectination of these three claws weak. Pilosity: On medial side of protopodite a longitudinal row of hairs; on lateral side usually more or less developed scattered hairs.

Mandible: Masticatory joint: Anterior tooth single, as in all species of the subgenus *Cythereis*; spine next to posterior bristle of the pars incisiva well developed, but narrow and weak. Of the two short ventro-distal bristles of first endopodite joint, the ventral one generally somewhat longer than corresponding bristle in text fig. VII, 9 of *C. (Cythereis) montereyensis*. Hairs in row of hairs on medial side of second endopodite joint of moderate length.

Fifth limb: Of about same type as in *C. (Cythereis) montereyensis*, ♂, but exopodite slightly longer, when compared with the protopodite; first exopodite joint slightly longer than second, or the three exopodite joints are nearly subequal in length. Bristle on posterior side of protopodite rather thick but not swollen at base, about as long as third exopodite joint, and along its entire length furnished with a dense coat of hairs of moderate length; bristle of first exopodite joint somewhat shorter in specimens examined than in text fig. VIII, 14 of *C. (Cythereis) montereyensis*; end claw slightly longer than in this figure, and almost naked.

Sixth limb: Of nearly same type as in *C. (Cythereis) montereyensis*, ♂. The following differences are to be noted: Exopodite slightly longer, when compared with protopodite; proximal bristle on anterior side of protopodite joint slightly longer; bristle on posterior side of this joint of same type and relative length as the corresponding bristle of preceding limb; bristle on first exopodite joint of same type as in male of the mentioned species but somewhat shorter than second exopodite joint; end claw somewhat longer relatively and almost naked.

Seventh limb: This differs in the following respects from the corresponding limb in the male of *C. (Cythereis) montereyensis*: Exopodite somewhat longer, when compared with the protopodite, and first exopodite joint slightly longer relatively; long bristle at about middle of anterior side of protopodite about as long as this side; bristle on posterior side of protopodite somewhat shorter; contrary to this bristle of the two preceding limbs, it has the same narrow type as the anterior bristle; bristle of first exopodite joint slightly weaker.

Brush-shaped organ: Of subequal thickness throughout its entire length, three to four times as long as wide; distal bristles somewhat longer than stem; no row of short hairs detected.

Penis (Pl. IV, fig. 2): Right and left organs similar; vas deferens with spiral thickening; ductus ejaculatorius with a rather short and narrow free distal part, forming a characteristic coil; copulatory appendage strongly arched proximo-dorsally, almost straight or slightly sinuated ventrally, narrowly rounded to almost pointed distally.

Description: Female—

Shell (Pl. I, fig. 1): Length, 0.96-1 mm.; length: height, about 1.70-1.75:1. Seen from the side: Left valve: Greatest height at about middle; dorsal half of anterior margin somewhat more flattened than in most species of the subgenus *Cythereis*, its ventral half very finely crenulated; posterior extremity of valve produced somewhat below middle in a distinct, broadly and irregularly rounded beak which is furnished with about three to six rather strong, blunt calcareous teeth. Anterior part of dorsal margin of valve sub-horizontal, nearly straight, or slightly arched or sinuated; posterior part of this margin sloping gently backwards and forming with the somewhat sinuated dorsal part of posterior margin a broadly rounded but conspicuous corner. Ventral margin slightly sinuated in front of middle, posteriorly gently and evenly arched, joining posterior margin without forming any corner. Right valve (text fig. 1) differs from left mainly in the following respects: Anterior margin somewhat sinuated dorsally; dorsal part of posterior margin somewhat more sinuated, which makes postero-dorsal corner still more conspicuous. Seen from below, shell is about 1.9 times longer than

wide, broadest at about middle, and of about same type as in *Cythereis kerguelensis*, G. W. Müller, 1908, p. 139. Sculpture of surface: Ventral main ridge one-sided and very strongly developed along whole ventral margin which it does not cover when shell is seen from the side; it ends suddenly, forming a somewhat rounded to rectangular angle somewhat in front of posterior beak-like process of shell; no other main ridges developed. Dorsally to and along edge of ventral main ridge, there is a series of somewhat oblong, fairly large excavations; greater part of surface covered with numerous, rather small, more or less rounded, and mostly scattered excavations, the number, size, and density of which vary; anteriorly and posteriorly shell has closely-set, irregular excavations of moderate size. Most of the excavations of the surface are of moderate depth, some rather shallow. Along ventral half of anterior margin and along anterior part of ventral margin, there is about fifteen to twenty flattened, hyaline, leaf-like bristles, furnished with short, fine marginal hairs. No dark fields to be detected when shell is regarded by transmitted light (of course, with the exception of the ridge).

Fifth limb: Differs from that of male chiefly in the following respects: Bristle on posterior side of protopodite somewhat swollen at base and furnished with a dense coat of long hairs; bristle on first exopodite joint about half as long as next joint, or even somewhat longer.

Sixth limb: Differs from that of male in the following respects: Bristle on posterior side of protopodite almost of same type as in the case of fifth limb of female; bristle on first exopodite joint of about same type and length as in *C. (Cythereis) montereyensis*, ♀, or somewhat longer.

Seventh limb: Differs from that of male chiefly in the following respects: Bristle of first exopodite joint somewhat longer, about as long as second exopodite joint or slightly shorter, and almost as strong as in text fig. VIII, 16 of *C. (Cythereis) montereyensis*; the claws of this and the two preceding limbs sometimes somewhat shorter than in male, being about as long relatively as in *C. (Cythereis) montereyensis*.

Genital verruca and posterior part of body as in *C. (Procythereis) iganderssoni*.

Remark: Two mature males and three mature females examined.

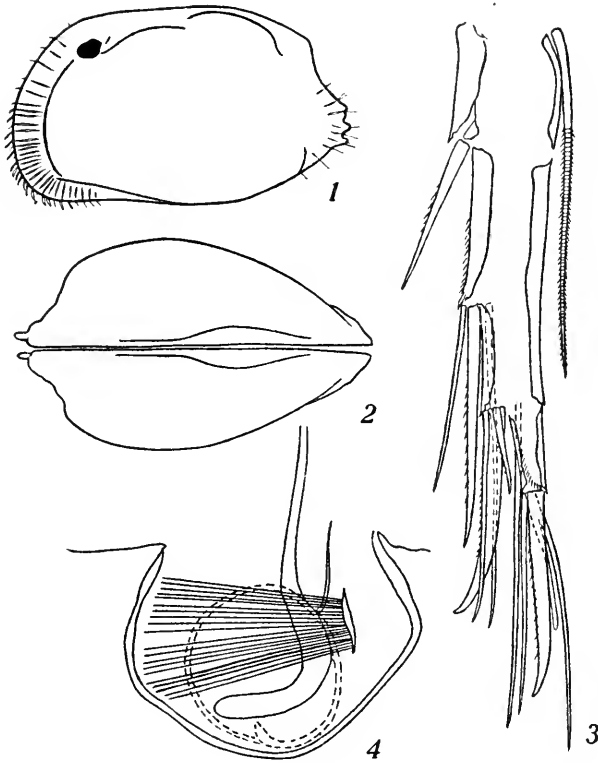
Habitat: Tierra del Fuego, Cape Valentyn; 12.III.1896; depth, 270 m.: Two females (S.M.E., 1896). Tierra del Fuego, Puerto Condor (type-locality): Two mature males and two mature females (S.M.E., 1896).

C. (*Procythereis*) *iganderssoni*, new species

Plate I, fig. 2; text fig. II.

Description: Female—

Shell (Pl. I, fig. 2; text fig. II, 1): Length, about 0.87 mm. (This was the length of one of my two specimens. The shell of the other specimen was somewhat shorter; it was, however, soft and evidently somewhat shrunk, its original length thus being impossible to state with full certainty.) Length: height, about 1.65:1; length: width, about 1.63:1. Seen from the side, of about same shape as in *C. (Procythereis) torquata*, ♀. Seen from below (text fig. II, 2): Ovate, widest somewhat behind middle; lateral contours (=the edge of main ventral ridge), evenly convex, converging gradually towards anterior extremity and fairly abruptly posteriorly; anterior extremity rather well pointed to narrowly rounded; posterior one beak-like, posterior parts of lateral contours being somewhat sinuated. End view almost equilaterally triangular, the three sides rather slightly to moderately convex and slightly irregular. Sculpture of surface: Ventral ridge one-sided (as is evident from the fact that the end view is equilaterally triangular) and very strongly developed; it continues along nearly entire length of shell and ends suddenly, forming a somewhat rounded to sub-rectangular angle, somewhat in front of posterior beak-like process of shell; its edge smooth and rather narrow. Just dorsally to and along the smooth edge of this ridge, there is a row of small, rounded to oblong pits of somewhat different sizes. Somewhat behind middle of shell, there is a dorsal ridge of moderate height, which ends in a broadly rounded angle somewhat in front of



Text fig. II. *Cythereis (Procythereis) iganderssoni* n. sp., ♀. 2, 3, 4, from type specimen.

1. Left valve from the side. $\times 52$.
2. Shell from below; front end to the right. $\times 53$.
3. Three distal joints of left first antenna, from lateral side. $\times 355$.
4. Left genital verruca, from lateral side; dotted line indicates medial opening. $\times 800$. Tierra del Fuego, Cape Valentyne.

postero-dorsal corner of shell. When right shell is seen from the side, the anterior part of edge of this ridge covers dorsal margin of valve; in left valve dorsal margin of valve is not covered by this ridge. Regarded from below (text fig. II, 2), each valve has a low ridge which runs rather close to the true ventral margin of valve; just in front of middle of valve, distance between margin of valve and this ridge is somewhat

greater than near anterior and posterior extremities. Entire surface of shell honey-combed with numerous rather deep, sub-rotund to more or less angular excavations of somewhat variable number and arrangement. Ridges between excavations narrow and smooth, bottoms of excavations apparently smooth. In other respects shell of this species agrees with that of *C. (Procythereis) torquata*.

First (text fig. II, 3) and second antennæ, mandible, and fifth, sixth, and seventh limbs about as in *C. (Procythereis) torquata*, ♀. Bristle on posterior side of protopodite of seventh limb perhaps somewhat, though rather slightly, shorter relatively, about half as long as corresponding bristle in *C. (Cythereis) montereyensis*. Bristle of first exopodite joint of this limb about as long as second exopodite joint or slightly longer.

Genital verruca of about the type shown in text fig. II. 4; ductus sickle-shaped and rather wide within verruca.

Posterior end of body of about same type as in *C. (Cythereis) montereyensis*, ♀. No spines were detected in the neighborhood of bristle on posterior extremity of body.

Description: Male; unknown—

Remarks: This species is structurally very close to *C. (Procythereis) torquata*. Indeed, in the females the only important differences between these two species are found in the shell. The differences exhibited by the sculpture of the shell are, however, so great that there hardly can be any doubt that we are dealing with two distinct species. An examination of the male of *C. (Procythereis) iganderssoni* will probably bring forth some important differences in the copulatory organs.

This species is named for Professor J. G. Andersson, a Swedish zoölogist and geologist, who was a member of the Swedish Magellan Expedition, 1895-1896, and of the Swedish Antarctic Expedition, 1901-03. It was mainly through Doctor Andersson's efforts that collections of ostracods were brought home by these expeditions.

Two mature females of this species were examined.

Habitat: Tierra del Fuego, Cape Valentyn (type-locality); 12.III., 1896; depth 270 m.: Two mature females (S.M.E.).

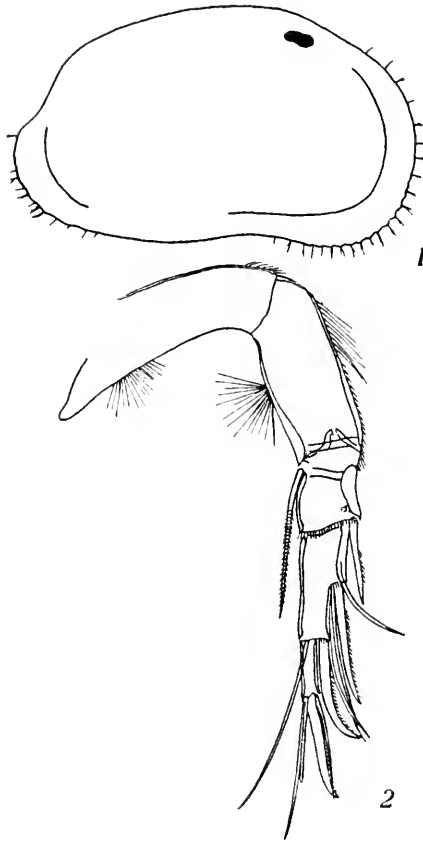
C. (*Procythereis*) *robusta*, new species

Plate I, fig. 3; text fig. III.

Description: Female—

Shell (Pl. I, fig. 3): Length, about 1.04 mm.; length: height, about 1.73:1. Seen from the side: Left valve: Greatest height at about middle. Ventral part of anterior margin somewhat crenulated. Posterior extremity of valve produced somewhat below middle in a very short, broadly and evenly rounded, beak without distinct teeth or crenulation; dorsal half of posterior margin almost straight. Dorsal margin of valve gently and evenly convex, sub-parallel to longitudinal axis of valve, forming with posterior margin a broadly rounded but distinct corner; ventral margin almost straight, slightly sinuated in front of middle. Right valve: Differs from the left mainly in the following respects: Anterior margin somewhat depressed dorsally; dorsal half of posterior margin distinctly sinuated; ventral margin somewhat more sinuated in front of middle. Seen from above of about the same shape as in *Cythereis kerguelensis*, G. W. Müller, 1908, p. 139. Sculpture of surface: Main ventral ridge developed along entire ventral margin of shell but very low. Surface covered with numerous small, rounded pits; on anterior and posterior extremities of shell pits arranged in groups of moderate size, surrounded by rather low ridges; some pits somewhat larger than others and contain a pore-canal with a bristle. Bristles as in *C. (Procythereis) radiata*. When regarded by transmitted light no dark fields are present.

First antenna (text fig. III, 2): Of about same type as in text fig. VI, 5 of *C. (Cythereis) montereyensis*, but fourth joint somewhat longer relatively, being about $\frac{7.5}{7}$, according to the scale used in the subgenus *Cythereis*. Latero-distal claw of fourth joint somewhat shorter than distal joint. Other bristles of this limb of about same types and relative lengths as in figure mentioned above but the long distal claw of fourth joint somewhat more curved and about twice as long as distal joint or slightly longer, and the narrow bristle in front of proximal claw of fourth joint somewhat shorter than claw. Pilosity: On medial side of first joint there is no longitudinal row of hairs; on proximal half of this joint, laterally, a longi-



Text fig. III. *Cythereis (Procythereis) robusta*, n. sp.

1. Right valve from the side, ♀, juvenis. $\times 64$.

2. Left first antenna, from medial side, ♀, type. $\times 185$.

S. A. E., Station 28.

tudinal row of fairly long hairs; pilosity of other joints about as in *C. (Procythereis) radiata*.

Second antenna: Shape and structure of protopodite and endopodite, and positions of bristles about same as in Pl. 35, fig. 19, G. W. Müller, 1894. In other respects this appendage agrees fairly well with the one in *C. (Procythereis) radiata*. The medial of the three bristles at about middle of posterior side of second endopodite joint with pectination of moderate

strength; its type about same as that of postero-lateral of these three bristles.

Mandible: Of about same type as in *C. (Procythereis) radiata*, but anterior tooth of pars incisiva of masticatory joint is paired.

Fifth limb: Of about same type as in *C. (Cythereis) montereyensis*, ♀. Of the two bristles at the knee, the slender medial one is strikingly longer than the lateral (about one and one-half times longer or even somewhat more). Proximo-dorsal spine on end claw developed just as in *C. (Procythereis) radiata*; no proximo-ventral spine was detected. Pectination of end claw of moderate strength.

Sixth limb: Differs from that of the female of *C. (Cythereis) montereyensis* mainly in the following respects: Bristle on posterior side of protopodite furnished with a number of long hairs near base; distally to these hairs are numerous short hairs; end claw of same type as in fifth limb.

Seventh limb: Differs from that of female of *C. (Cythereis) montereyensis* mainly in the following respects: Bristle on posterior side of protopodite joint only about half to one-third as long; middle one of the three bristles on anterior side of this joint slightly shorter, being about as long as anterior side of joint; end claw of about same type and relative length as in sixth limb.

Genital verruca seems to be of about same type as in *C. (Procythereis) iganderssoni*.

Description: Male; unknown—

Remarks: The systematic position of this species is somewhat uncertain. In some respects it approaches *C. (P.) radiata*, in others *C. (P.) torquata* and *iganderssoni*. Its assignment to the Torquata group is due mainly to the type of the genital verruca of the female. Its allocation can not be decided with certainty until the male has been examined.

Habitat: South Georgia—S.A.E., station 28, lat. 54° 22' S., long. 36° 28' W. (type-locality); 24.V. 1902; depth, 12-15 m.; sand and algae: One mature female and one larva.

Radiata Group nov.

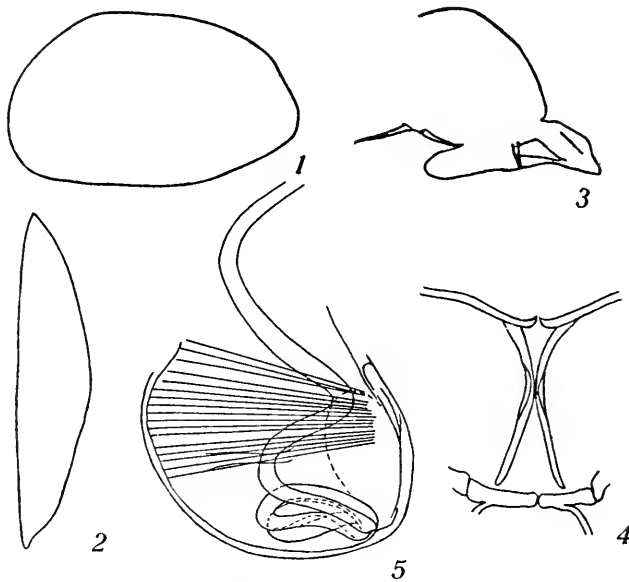
Among the species described in the present paper, *Cythereis* (*Procythereis*) *radiata* and *polita* belong to this group. Among those described previously, *Cythereis kerguelensis*, G. W. Müller, 1908, p. 138, in all probability also belongs here. G. W. Müller, 1908, suggested that this species would be closely related to *C. convexa* G. W. Müller, 1894. This view presumably is incorrect; *C. convexa* appears to be a typical member of the subgenus *Cythereis*. The question as to whether *C. kerguelensis*, G. W. Müller, 1908, is identical with *C. kerguelensis* G. S. Brady, 1880, can not be decided as yet. The description and figures of this species given by Brady are too incomplete and uncertain to allow a well founded identification of species. (It is to be noted G. W. Müller, 1908, 1912, used the name *kerguelensis* instead of *kerguelensis*.)

C. (*Procythereis*) *radiata*, new species

Plate I, fig. 4; Plate IV, fig. 3; text fig. IV.

Description: Male—

Shell: Length, 0.80 mm.; length: height, about 1.75:1; length: breadth, about 2.3:1. Seen from the side: Left valve (text fig. IV, 1): Of about same shape as in *C. (Cythereis) montereyensis*; dorsal margin, however, slightly more flattened anteriorly, and ventral margin somewhat more arched just behind middle and not sinuated in front of middle; margin without teeth and crenulation. Right valve: Somewhat longer than left one and at the same time somewhat lower relatively. It differs from that of *C. (Cythereis) montereyensis*, ♂, mainly in the following respects: Somewhat lower relatively, especially posteriorly; dorsal margin slopes slightly more posteriorly and sinuation of ventral margin seems to be broader. Seen from above (text fig. IV, 2), of about same shape as in *C. (Cythereis) montereyensis*, ♂, with greatest width at about middle. Sculpture of surface of shell: Ventral main ridge one-sided and rather low, well developed along entire ventral margin of shell; posteriorly it is continued by a low ridge, running at some distance from, and about parallel to, posterior margin of shell. Surface of shell covered with



Text fig. IV. *Cythereis (Procythereis) radiata*, n. sp. 1, 2, 3, 4, ♂, type specimen. 5, ♀.

1. Left valve from the side. $\times 49$.
2. Left valve from below. $\times 57$.
3. Right penis. $\times 115$.
4. Chitinous support of posterior part of body dorsally to the penes; the parts below the X belong to penes. $\times 175$.
5. Genital verruca from lateral side. $\times 800$. Tierra del Fuego, Borja Bay.

numerous rather closely-set excavations of different sizes; excavations on posterior half of shell usually of moderate size, those on anterior half generally somewhat smaller; most of these excavations more or less rounded, some sub-angular; most of them arranged in rather distinct rows, radiating from center of shell (a character from which the species has been named); in center of shell excavations are rather few and scattered. Along anterior margin and along anterior part of ventral margin, shell has about twenty-five to thirty flattened, leaf-like, hyaline bristles of moderate length furnished with short, fine marginal hairs; among these bristles a number of narrow, simple bristles of moderate length occur, and along ventral and posterior margins of shell, there are a few narrow,

simple bristles of moderate length. When shell is regarded by transmitted light, no dark fields are to be detected (of course, the ridges excepted).

First antenna: Of about same shape as in text fig. VI, 5, of *C. (Cythereis) montereyensis*; fourth joint, however, slightly longer relatively, being about $\frac{7}{6}$, according to scale used in the subgenus *Cythereis*. Latero-distal claw of fourth joint about as long as end joint and of about same size and type as in *C. (Procythereis) torquata*, or somewhat stronger. Other claws and bristles of about same types and relative lengths as in text fig. VI, 5 of *C. (Cythereis) montereyensis*, with the following exceptions: Long distal claw of fourth joint usually somewhat more curved than in this figure, somewhat shorter than posterior side of second joint, and somewhat more than twice as long as end joint; the narrow bristle in front of proximal claw of fourth joint somewhat shorter than claw, its length, however, as in most other species of this genus, probably rather variable. Pilosity: There seems to be no longitudinal row of hairs on lateral side of first joint; on medial side of this joint there is an irregular, longitudinal row of short hairs; these hairs were almost scattered in the male and female examined by me; hairs along anterior side of second joint very short; only a bunch of rather long hairs are to be found near proximal boundary of this joint; hairs on the two distal joints very short and weak.

Second antenna: Protopodite, endopodite, and exopodite have about same shapes as in text fig. VI, 6 of *C. (Cythereis) montereyensis*, but second endopodite joint slightly longer relatively. Among bristles of second endopodite joint, the two on anterior side and the group of three at about middle of posterior side are situated a little more distally than in the mentioned figure. Of the three last-mentioned bristles, the two lateral ones are of about same types as in *C. (Cythereis) montereyensis*; the medial one of them only about half as long as the postero-lateral, of about same shape as in text fig. XVI, 3 of *C. (Cythereis) ephippiata*, and furnished with fine pectination. The powerful postero-distal bristle of this joint slightly shorter relatively than in text fig. VI, 6 of *C. (Cythereis) montereyensis* and not so weak distally. Pilosity: On lateral side of protopodite there is a number of more or

less scattered, very short hairs; hairs on anterior side of second endopodite joint somewhat more numerous and longer than in the mentioned figure of *C. (C.) montereyensis*. Of the distal plates of second endopodite joint, the lateral one is furnished with rather strong spines, the medial with very fine pectination. Proximal end claws have fairly strong pectination.

Mandible: Masticatory joint: Anterior tooth single, just as in all the species of the subgenus *Cythereis*; spine next to posterior bristle on pars incisiva exceedingly small (sometimes not developed at all?). Hairs in the row of hairs on medial side of second endopodite joint of moderate length.

Fifth limb: Of about same type as in *C. (Cythereis) montereyensis*. Differences (see also description of subgenus): Bristle on posterior side of protopodite somewhat stronger; bristle on first exopodite joint with a blunt point in the specimen examined; end claw with weak pectination and with a small spine ventrally near base; length of this spine about one-third the height of claw at point of attachment of spine; somewhat proximally to this spine, there is on dorsal side of end claw a still smaller, vestigial spine. The position of these two spines indicates that they are to be considered as vestiges of two bristles on the original end joint, which is now merged with the end claw.

Sixth limb: Of about same type as in *C. (Cythereis) montereyensis*, ♂. Differences: Middle bristle on anterior side of protopodite joint about as long as this side; bristle on posterior side of this joint of about same type and size as corresponding bristle of fifth limb; end claw resembles that of fifth limb.

Seventh limb: This appendage differs from that of *C. (Cythereis) montereyensis*, ♂, mainly in the following respects: Middle one of the three bristles on anterior side of protopodite joint perhaps slightly shorter relatively; bristle on posterior side of this joint only about half as long as in text fig. VIII, 16 of *C. (Cythereis) montereyensis*, or somewhat shorter. Bristle of first exopodite joint has same narrow shape and about same relative length as corresponding bristle of sixth limb; i.e., it is almost as long as second exopodite joint; it is, however, furnished with numerous short hairs, while this

bristle of sixth limb has but a few short hairs or is almost naked. End claw, which has two proximal spines, just as end claws of the two preceding limbs, is, perhaps, slightly shorter than in text fig. VIII, 16 of *C. (Cythereis) montereyensis*. End claws of fifth and sixth limbs are, perhaps, also slightly shorter relatively than in the mentioned species.

Brush-shaped organ of about same type as in *C. (Cythereis) montereyensis*.

Penis: About as shown in text fig. IV, 3 and in plate IV, fig. 3. Vas deferens has spiral thickenings; ductus ejaculatorius of moderate length, moderately curved, concave ventrally, and ends in a free point at about middle of ventral edge of copulatory appendage. Body of penis rounded and characterized by a lateral three-branched chitinous strip, which ends at postero-dorsal corner of copulatory appendage. Copulatory appendage characterized by a rather large postero-ventral process, which is fairly broadly rounded distally; edge of this process furnished with radiating, partly branched striae. Anterior part of copulatory appendage of moderate length and height, pointed, resembling bill of a crow; this appendage of left penis differs slightly from that of right penis in having dorsal edge more uniformly convex.

Description: Female—

Shell (Pl. I, fig. 4): Length, about 0.84 mm.; length: height, about 1.7:1. Of about same shape and structure as in male but somewhat higher relatively.

Second antenna: Of about same type as in male.

Fifth limb: Of about same type as in male; bristle on posterior side of protopodite somewhat swollen at base and furnished with long, soft hairs; bristle of first exopodite joint well pointed.

Sixth limb: Resembles that of male; bristle on posterior side of protopodite similar to corresponding bristle of female fifth limb; bristle of first exopodite joint of same type and size as corresponding bristle in *C. (Cythereis) montereyensis*, ♀.

Seventh limb: Resembles that of male, but bristle of first exopodite joint, perhaps, slightly stronger and shorter.

Genital verruca (text fig. IV, 5): Of about same type as in *C. (Cythereis) montereyensis*, but ductus is somewhat S-

shaped and forms distally a little bundle of about two and one-half coils.

Remark: One mature male, one mature female, and one larva were examined.

Habitat: Falkland Islands—S.A.E. station 51, Port William; 3.1X, 1902; depth, 22 m.; sand: One empty shell.

Tierra del Fuego: Borja Bay; 7.IV.1896; depth, 18 m. (type-locality): One mature male, one mature female, and one larva (Swedish Magellan Exp. 1896).

C. (*Procythereis*) *polita*, new species

Plate I, fig. 5; Plate IV, fig. 4; text fig. V.

Description: Male—

Shell (Pl. I, fig. 5): Length, about 0.67 mm.; length: height, about 1.8:1; length: breadth, about 2.1:1. Seen from the side: Left valve: Subreniform, with greatest height situated somewhat in front of middle; anterior margin without, or at any rate with hardly distinguishable, crenulation; dorsal margin, which is evenly and rather strongly arched, slopes fairly steeply backwards and does not form distinct corners with anterior and posterior margins; posterior extremity rather narrow, well and evenly rounded, without teeth; ventral margin somewhat sinuated just in front of middle of shell. Right valve: Differs from the left mainly in the following respects: Anterior margin slightly sinuated dorsally; dorsal part of posterior margin slightly sinuated. Seen from above, shell has about same shape as in *Cythereis kerguelensis*, G. W. Müller, 1908, p. 139. Sculpture of surface: Ventral main ridge very low, scarcely distinguishable; no other ridges developed. Surface has rather numerous, small, rounded pits, most of which are situated on posterior half of shell; on anterior half but few scattered pits are to be found; some of the pits, especially near margin of shell, arranged in rows, which run more or less parallel to margin of shell; number of pits somewhat variable. Along anterior margin and along anterior part of ventral margin of shell, there are about 20 to 25 hyaline, leaf-like bristles with marginal hairs (of about same types as in *Cythereis kerguelensis*, G. W. Müller, 1908, fig. 5); among these bristles and along ventral and pos-



Text. fig. V. *Cythereis (Procythereis) polita*, n. sp.

1. Left valve from the side, ♀. Tierra del Fuego, Isthmus Bay. $\times 60$.
2. Left penis, type specimen. Tierra del Fuego, no definite locality. $\times 135$.

terior margins of shell, there are a few narrow, simple bristles of moderate length. When regarded by transmitted light, no dark fields are to be detected.

First antenna: Of about same type as in *C. (Procythereis) radiata*. On lateral side of first joint there is proximally a short longitudinal row of hairs; latero-distal claw of fourth joint slightly shorter than end joint.

Second antenna: Of about same type as in *C. (Procythereis) radiata*. Bristle of first endopodite joint somewhat shorter than in *C. (Cythereis) montereyensis*; spines on disto-lateral plate of second endopodite joint rather weak.

Mandible: Of about same type as in *C. (Procythereis) radiata*, but anterior tooth of pars incisiva of masticatory joint is paired.

Fifth limb: Of about same type as in *C. (Procythereis) radiata*, ♂. Of the two bristles at the knee, the weak, medial one is rather strikingly longer than the strong lateral one. (In *C. [Procythereis] radiata* these bristles have about same relative lengths as in text fig. VIII, 14 of *C. Cythereis montereyensis*.) Bristle of first exopodite joint of subuniform thickness throughout its entire length but has a sharp point.

Sixth limb: Of about same type as in *C. (Procythereis) radiata*, ♂. Bristle of first exopodite joint about as long as second exopodite joint.

Seventh limb: Of about same type as in male of *C. (Procythereis) radiata*. Bristle on posterior side of protopodite about one-third as long as corresponding bristle in *C. (Cy-*

thereis) *montereyensis*; bristle of first exopodite joint of about same type and length (i.e., about as long as second exopodite joint) as corresponding bristle on sixth limb but has numerous short hairs; end claw about as long as distal joint, just as in the two preceding limbs.

Brush-shaped organ: Of about same type as in *C. (Procythereis) radiata*.

Penis (Pl. IV, fig. 4; text fig. V, 2): Very similar to this organ in *C. (Procythereis) radiata*. Main difference is that postero-ventral, beak-like process of copulatory appendage is truncate posteriorly and has but a slight indication of marginal striation; dorso-posterior chitinous support of penis has about type shown in text fig. IV, 4 of *C. (Procythereis) radiata*.

Description: Female—

Shell (text fig. V, 1): Length, about 0.70-0.74 mm.; length: height, about 1.7-1.75:1; length: breadth, about 2:1. Seen from the side of about same shape as in male but somewhat higher relatively, and its dorsal margin slopes slightly less posteriorly. Seen from above it also resembles that of male, with the exception that it is slightly broader relatively. In other respects shells of the two sexes agree.

Second antenna: Of about same type as in male.

Fifth limb: Of about same type as in *C. (Procythereis) radiata*, ♀; bristles at knee about as in male.

Sixth limb: Of about same type as in female of *C. (Procythereis) radiata*.

Seventh limb: Of about same type as in female of *C. (Procythereis) radiata*. For length of bristle on posterior side of protopodite and of end claw, see description of male; bristle of first exopodite joint distinctly shorter than second exopodite joint.

Genital verruca about as in *C. (Procythereis) radiata*.

Remark: One male and two females were examined.

Habitat: **Tierra del Fuego**—No definite locality; 5.II; 1896; depth, 18 to 36 m.: One mature male (type specimen). **Isthmus Bay**; 29.III.1896; tide-pool: Three mature females, one larva (S.M.E.).

Subgenus **Cythereis** (T. R. Jones)

Description:

Shell: Without or with rather slight sex dimorphism. The shape of the shell and the sculpture of the surface show very striking differences in the different species; within each species, on the other hand, they are usually fairly constant. The anterior margin of the shell is apparently always of about the same shape as in *C. (C.) montereyensis*; i.e., it is boldly and evenly rounded, slightly flattened dorsally, and joins the ventral margin without forming any distinct corner. The left valve usually somewhat larger than the right; the difference in size is, however, varying even within the species. The inner line runs at a moderate distance from and about parallel to the margin of the shell. The line of concrescence either coincides entirely with the inner line, or these lines are separated only along a short distance inside the anterior margin of the shell. The marginal pores are very numerous; their number varies, however, even within the species. Especially along the anterior margin and along the anterior part of the ventral margin of the shell, they are very closely set. Along the posterior part of the ventral margin and along the posterior margin, they are more widely spaced. Most of these pores are somewhat widened at about their middle or near the margin of the shell; all or nearly all of them are simple. A great number of them are furnished with simple and generally flattened marginal bristles. (As an illustration of this description, I refer to Plate XXVIII, fig. 19, *Cythereis convexa*, G. W. Müller, 1894.) The pores of the surface of the shell seem usually to be moderate in number. Some of them have a short, simple bristle. (Frequently these pores are very difficult to detect.) The selvage is in most cases very difficult to distinguish. It seems to be rather narrow or of a moderate width, striated, and its edge is even or nearly so. The eye appears always to be present. The hinge of the right valve consists of one anterior and one posterior terminal tooth. On the left valve there is one anterior tooth, situated just behind the anterior tooth of the right valve. The three teeth are rather strong and fit into corresponding sockets of the opposite valve. Between the teeth there is in most cases a more or less developed ridge which fits into a corresponding furrow on the

opposite valve. The muscle-spots usually very difficult to distinguish. In most cases they appear to be of about the type shown in text fig. VI, 4 of *C. (C.) montereyensis*. Sometimes, however, I was not able to detect the small dorsal and ventral spots. The two central groups, consisting of three and four spots respectively, seem always to be present. Often the field occupied by the muscle-spots is somewhat elevated. In all the species of this subgenus examined by me, the shell was characterized by a strong calcareous incrustation.

First antenna: This limb has no sex dimorphism. Normal type: Strong and of moderate length; five-jointed; most of the joints with rather thick walls. Relative lengths of the joints about as follows. [These figures are from measurements of *C. (Cythereis) glauca* n. sp.]

$$\text{I. } \frac{11}{15} \quad \text{II. } \frac{13^*}{10} \quad \text{III. } \frac{4}{5} \quad \text{IV. } \frac{2}{2} \quad \text{V. } \frac{3}{4}$$

The length of the fourth joint is variable. In the species mentioned above it is about $\frac{7.5}{6.5}$. Exceptionally it is as short as $\frac{7}{5}$ [*C. (Cythereis) montereyensis*], and as long as $\frac{11}{10}$ [*C. (Cythereis) frequens*]. Generally speaking, the joints are somewhat narrower the more distally they are situated. The distal joint is rather narrow and of subuniform width throughout its whole length. The fourth joint is always characterized by the fact that it suddenly grows narrower at about the middle, the anterior edge of this joint being strikingly notched at about the middle. The number of the bristles seems to be constant; anyhow, in the specimens examined by me, I found no variation in this respect. The positions of the bristles appear to be practically the same in all species. In regard to shape and strength, too, the bristles are remarkably constant. Only the claw-like bristles of the three distal joints show some variations in their shapes, being more or less curved. These differences seem not to be specific, since rather pronounced variations are found even within the species. The

*The second joint seems to have a rather constant relative length within this subgenus. Thus, when giving the relative lengths of the joints of this antenna, I have always in this paper started from 13 as the length of the anterior side of the second joint. In other words, the figures in the descriptions of this paper give only the proportions between the length of the anterior side of the second joint and the lengths of the remaining joints. Nevertheless, these figures give a fair idea of the shape of the limb.

relative lengths of the bristles are rather constant, even though small variations seem to occur in most species; it does not appear advisable to attach much taxonomic value to differences in this respect. The first joint lacks bristles. The second joint has postero-distally a bristle of moderate strength, about as long as or somewhat longer or shorter than the posterior side of this joint, more or less distinctly annulated, and furnished with fine, short hairs. On the third, fourth, and fifth joints there are altogether four powerful, pointed claws which may be straight but generally are slightly curved. One of these is located antero-distally on the third joint; one at about the middle of the anterior side of the fourth joint; one antero-distally on the fourth joint; and one distally on the distal joint. Of these claws, all of which are finely pectinated, the proximal one is usually somewhat weaker than the others; and its tip reaches somewhat beyond the point of attachment of the next claw. The three remaining claws are subequal and about as long as or somewhat shorter (exceptionally somewhat longer) than the posterior side of the second joint. The third joint has no bristles except the antero-distal claw-like one mentioned above. Fourth joint: Near the proximal claw there are two long, narrow, naked, non-annulated bristles. One of these, situated in front of the claw, is somewhat longer to somewhat shorter than this claw (usually somewhat shorter). The other, situated behind the claw on the inner side of the joint, is longer; its point reaches to or nearly to the point of the distal claw of this joint. Close by the distal claw of this joint two similar bristles are to be found. These have the same positions and about the same relative lengths (or somewhat longer), when compared with the distal claw, as the two proximal bristles have, when compared with the proximal claw. Close by the distal claw of this joint, on the outer side of the joint, a short, powerful, spine-like bristle is to be found. This has a length about equal to the proximal thickness of the distal joint, and it is directed more or less forward (contrary to all other bristles of this limb which have about the same direction as the distal joint). This spine-like bristle, which I term the latero-distal spine, is usually furnished with some short hairs. Close by the end claw, the distal joint has two bristles of the same type and of about the same positions and

relative lengths as the two long and narrow bristles close by the long distal claw of the fourth joint. The posterior of these two bristles is united at the base with a narrow, naked, non-annulated, sensorial bristle, which is somewhat rounded distally and usually not quite so long as the end claw. Pilosity: The pilosity of the first joint seems to be subject to rather pronounced variations. Within each species, on the other hand, it is fairly constant, even though some variations are found. A bunch of more or less long hairs seems to occur in almost all species proximo-ventrally-laterally; and dorso-distally nearly always a few short hairs are to be found. The pilosity of the four distal joints seems always to be fairly constant; slight variations occur, however, even within the species. Second joint: Along the proximal half of the anterior edge, often somewhat laterally, there is a more or less dense row of rather long hairs. Along the distal half of this edge, also somewhat laterally, a fine, dense pectination is to be found. Antero-distally the hairs of this pectination generally are somewhat longer. At about the middle of the posterior side there is a bunch of rather long hairs. The anterior edge of the third joint is naked or furnished with only a few hairs. Along the medio-distal edge of this joint, there is a dense, fine pectination of short hairs. The fourth and fifth joints are almost naked on the medial side. Only at the bases of the claws of these joints a few short, fine hairs usually occur. Along the lateral side we find a row, often discontinuous, of short hairs running slantingly from the antero-proximal corner of the fourth joint to the postero-distal corner of the fifth joint. Along the proximal part of the anterior edge of the fourth joint such hairs are also to be found. As an illustration of this description, I refer to text fig. VI, 5 of *Cythereis (Cythereis) montereyensis*.

Second antenna: This limb shows sex dimorphism. Normal type:

Male: Strong and of moderate size; four-jointed. Situated on a well developed, joint-like process, which is furnished with a strong chitinous support. In most species this support shows about the same shape [see text fig. XIX, 3 of *C. (C.) glauca*]; variations occur, however, even within the species. (As to the morphological interpretation of this joint-like process, see

my paper of 1920, p. 79.) The three joints of the endopodite have rather thick walls. Relative lengths of these joints about as follows [from measurements of *C. (C.) glauca*]:

Protopodite $\frac{10}{8}$ Endopodite I. $\frac{7}{3-4}$ II. $\frac{17-18}{15-16}$ III. 2.

As a rule, this appendage is slightly more elongated and weaker than in *C. (C.) montereyensis*; see text fig. VI, 6 of this species. Generally speaking, the joints of the endopodite are narrower the more distally they are situated [exception, *C. (C.) platycopa*]; the distal joint is narrow and small. The second endopodite joint is characterized by the fact that it suddenly grows narrower at about the middle; its posterior edge being rather strikingly notched at this place. The protopodite has no bristles. The exopodite, which is of subuniform thickness throughout its entire length and about as long as, or generally somewhat longer than, the endopodite (without the end claws), usually is slightly weaker than in text fig. VI, 6 of *C. (C.) montereyensis*. It is generally two jointed. The proximal joint, which in most cases is somewhat more than twice as long as the end joint, shows, however, nearly always signs of an articulation somewhat distally to the middle; exceptionally this articulation is almost as distinct as the distal one. Endopodite: The first joint has one posterior bristle, which in most cases is somewhat shorter than the posterior side of the second endopodite joint, of moderate strength, non-annulated, and furnished with short hairs. [When not otherwise mentioned, it is about as long as in *C. (C.) montereyensis*.] Second joint: On the anterior edge, always somewhat distally to the middle of the joint, there are two closely-set, narrow, non-annulated bristles. Both of these usually are naked; however, a few short and fine hairs may be found on one or both of them; this character varies within the species. One of these bristles extends to the middle or even as far as to the point of the end claw. The other extends to about the middle or to the end of the distal joint. At about the middle of the posterior side, thus slightly proximally to the two bristles on the anterior side, there is a group of three non-annulated bristles. The postero-lateral one of these bristles, which is nearly always the longest [see *C. (C.) longiductus*, ♂, and *C. (C.) frequens*, ♂], is rather long, extends to or somewhat beyond the distal boundary of the joint, is of or-

dinary type, of moderate strength, and furnished with a short, more or less strong pectination. The antero-lateral one of them is rather narrowly claviform, naked, hyaline, sensorial, and not quite half as long as the postero-lateral one. The remaining one of these three bristles shows rather great variations within this subgenus. Postero-distally this joint has two closely-set, non-annulated bristles. One of these, which is very weak and short, usually is less than half the length of the other. The other is rather strong, somewhat curved, generally rather finely pectinated, and about twice as long as the end joint or somewhat shorter. Distal joint: With three slightly curved, rather powerful, non-annulated claws; one situated antero-distally; the two others posteriorly, slightly proximally to the first. The antero-distal one is usually about two to three times longer than the anterior side of this joint or slightly shorter. The two others are in most cases subequal and slightly shorter. The antero-distal is naked or almost so: the two others are weakly pectinated. [When not otherwise mentioned, the lengths of these claws are about the same as in *C. (C.) montereyensis*.] The pilosity is subject to slight variations, even within the species; it shows, however, on the whole, a rather constant type. Protopodite: Proximo-ventrally, there is a group of hairs of moderate length; sometimes these hairs are rather few and short. On the medial side, at or somewhat distally to the middle and somewhat above half the height of the joint, there is sometimes a slanting row of rather short hairs. In the neighborhood of this row, scattered short hairs are often to be found. Dorso-distally a few short hairs usually occur. At the base of the exopodite some short hairs also are to be seen. Endopodite: First joint: Near the anterior edge, often somewhat proximally to the middle of the joint, there is a group of more or less long hairs. Disto-anteriorly-laterally, some hairs are often to be found. Along the disto-lateral edge, a very fine, hardly distinguishable (Reichert's oc.4, Leitz's immers. $\frac{1}{12}$) pectination has been detected in a few species. This character, however, is not taken into consideration in my descriptions of species, on account of the difficulty in making a quite certain statement. Second joint: At a point about one-third of the length of the anterior edge of this joint, there is a bunch of hairs of moderate

length. At the bases of the bristles located at about the middle of the anterior and posterior edges of the joint, some rather short hairs occur. Just proximally to the group of three bristles on the posterior edge of the joint, some very short hairs are to be found. This joint is continued distally by two thin rounded plates, which partly cover the medial and lateral sides of the distal joint. Along the posterior parts of the free edges of these plates, there is a series of rather short, spine-like hairs; proximally to which often a few rather short, fine hairs are to be found. Distal joint: At the base of the antero-distal claw, a series of short, spine-like hairs. (These are often so small that they are nearly invisible with Reichert's oc.4, Leitz's immers. $\frac{1}{12}$.) As an illustration of this description, I refer to my text fig. VI, 6 of *C. (C.) montereyensis*.

Description: Female—

This differs from that of the male chiefly in the following respects: The exopodite [see text fig. VI, 7 of *C. (C.) montereyensis*], which is somewhat reduced, usually about as long as or but slightly shorter than the anterior side of the second endopodite joint, is two-jointed in most species. The first joint, which generally shows no signs of further articulation, is in most species somewhat widened distally. As to whether the chitinous folds, which often occur at the base of this branch, are signs of articulation, I have no definite opinion. The distal joint, which is somewhat less than half the length of the proximal joint, is considerably narrower than the proximal joint, somewhat curved and irregular, and more or less pointed. The first endopodite joint: The bristle is usually somewhat longer than in the male. The medial one of the three bristles at about the middle of the posterior edge of the second endopodite joint has about the same type as the long postero-lateral one of these bristles, but is somewhat shorter, usually not quite as long as in text fig. VII, 8 of *C. (C.) montereyensis*. The two proximal claws of the distal joint are often furnished with slightly stronger pectination than in the male.

Mandible: Without or with but slight sex dimorphism.

Normal type: The masticatory joint, i.e., the first protopodite joint, has in nearly all the species of this subgenus examined by me almost perfectly the same type as in text fig. VII, 9 of

C. (C.) montereyensis. In other words, it is very strong, rather short, and wedge-shaped. Its lower half is very broad and almost square; its upper half tapers dorsally. At about the middle of the posterior side it is distinctly notched; and sometimes it has a rounded hump on the anterior side of its upper half. The toothed edge of the pars incisiva is broad and has a number of smooth, almost equilaterally triangular teeth; these, generally speaking, decrease slightly in size the more posteriorly they are situated. The two anterior ones and the posterior one of these teeth (the last is rather narrow) are usually single. Exceptionally the next to the anterior tooth is paired, and the posterior one may be slightly bifurcated distally. Between these single teeth five pairs of teeth are to be found, corresponding to five deeply bifurcated teeth. The next to the posterior pair, which sometimes is represented by a single tooth, is in some cases very small. Behind and close by the posterior, single, tooth, a short narrow bristle is to be found. Between teeth Nos. 1 and 2 (counted from in front), there are two short, slightly bent bristles; and between tooth No. 2 and the first pair of teeth (or, if tooth No. 2 is paired, between the first and second pairs of teeth), a similar, smaller, more or less bent bristle is to be found. The types of these bristles vary somewhat even within the species; usually they are about as in text fig. VII, 10-12 of *C. (C.) montereyensis*. On the anterior side of the masticatory joint, just below the palp, there is a short, usually slightly annulated, sometimes non-annulated, bristle with short hairs; this bristle is about as long as, or somewhat shorter than, the end joint of this limb. In all the species of this subgenus, which I have had the opportunity to examine, the palp shows almost perfectly the same type as in text fig. VII, 9 of *C. (C.) montereyensis*. It is rather large. Its length is subequal to the height of the masticatory joint. Its proximal height nearly equals the width of the toothed edge of the pars incisiva of the last-mentioned joint; and it grows gently narrower distally. The end joint is rather narrow, of subequal height throughout its entire length, and strikingly narrower than the distal part of the preceding joint. The number of joints is difficult to establish with full certainty. However, according to the muscular system, there are probably four joints. Only the distal joint is

sharply marked off from its predecessor. The proximal boundary of the next to the distal joint is in most species rather distinct. The relative lengths of these joints are about as follows: [The figures taken from measurements of *C. (C.) montereyensis*.]

Protopodite II. $\frac{4}{4}$ Endopodite I. $\frac{7}{4}$ II. $\frac{6}{6}$ III. $\frac{4}{4}$

The number of bristles seems to be almost perfectly constant; at any rate, in all the specimens of all the species but one [*C. (C.) longiductus*] examined by me, I found no variation in this respect. Their positions and types, too, show very remarkable constancy. Their relative lengths are rather constant; slight variations in this respect, however, are found even within the species. The second protopodite joint has two bristles. One of these, which is situated at about the middle of the ventral side of the joint, is usually non-annulated or almost so, has short hairs, and its length is subequal to the height of the joint. The other, which is directed more or less distally, and situated medially and somewhat distally to the first-mentioned bristle, is usually annulated, furnished with long secondary bristles, and its point generally extends to about the boundary between the first and second endopodite joint. The epipodial appendage is situated dorso-laterally near the distal boundary of the second protopodite joint. It is short, verruciform, and furnished with a rather long bristle, the length of which is subequal to the height of the second protopodite joint, and which is non-annulated and furnished with long hairs. In front of this bristle there are a very short, vestigial bristle and a rather short, peg-like, generally naked appendage. (It is difficult to state with full certainty whether or not this peg is naked.) In all the species of this subgenus examined by me this appendage had the type described above: but since it is extremely difficult in most specimens to establish its structure, I can give no information about the constancy within each species. It seems fairly probable, however, that it is rather constant. Endopodite: First joint: This has in most species four ventero-distal bristles [see *C. (C.) longiductus*, ♂, ♀]. Two of these are powerful, long, usually somewhat longer than the dorsal side of proximal joints of the palp, non-annulated, and furnished along the greater parts of their lengths with rather long and stiff hairs arranged in two

more or less distinct rows. The remaining two, which are situated medially to the others, are rather weak and short. Usually they are somewhat shorter than the distal height of this joint, and the ventral one of them is generally somewhat longer than the dorsal. They are furnished with short, or more or less long, hairs; and not annulated, or only rather slightly so. Dorso-distally this joint has a single bristle, which has about the type of the two last-mentioned bristles; it has short hairs, and in most species it is about as long as half the length of the second joint or somewhat more. Second joint: This has, at or slightly distally to the middle, a very powerful and long ventero-lateral bristle, which is distinctly longer and more powerful than the two long and strong ventro-distal bristles of the preceding joint. This bristle is non-annulated and furnished with rather long and soft hairs, situated on the convex side of the bristle. These hairs are much more numerous and closely-set than those of the long ventro-distal bristles of the preceding joint. Close by, and medially to, this long bristle, there is a weak, naked bristle, usually about as long as, or rather slightly longer than, the proximal width of the former. Dorso-distally this joint has eight bristles, most of which frequently are attached to a small verruciform process; see Plate 35, fig. 20, G. W. Müller, 1894. Five of these bristles are rather narrow, non-annulated, naked, or almost so, and usually about as long as, or somewhat shorter or longer than, the dorsal side of the first and second endopodite joint. One bristle, which is not attached to the verruciform process, is generally somewhat shorter, but slightly more powerful, than these five bristles, distinctly annulated, and furnished with short hairs. The two remaining bristles are of about the same type but weaker, and usually only about half as long or even less. End joint: This has four distal bristles. Two of these are rather powerful, usually about twice as long as the joint, non-annulated, and naked or almost so. The dorsal one is about as strong as, but generally somewhat shorter than, the first two, annulated, and furnished with short hairs. The remaining bristle, which is ventro-medial in position, is only about as long as or even somewhat shorter than this joint, weak, non-annulated, naked or almost so. Although subject to some variations even within the

species, the pilosity shows, on the whole, a very constant type. Along the anterior side of the masticatory joint, just dorsally to the bristle, a number of rather short, fine or rather coarse hairs occur. Endopodite: Along the dorsal side of the first joint, there is a number of rather long, partly fairly coarse hairs. Along the proximal half of the ventral side of the second joint, there is a series of hairs of moderate length. Close by, and laterally to, the strong ventral bristle of this joint, there is a bunch of hairs, usually of moderate length, and often rather stiff. On the medial side of this joint, somewhat below half its height, a longitudinal row of hairs occurs; generally most of these hairs are so small and fine that they are hard to detect even with Reichert's oc.4, Leitz's immers. $\frac{1}{12}$. The end joint often has fine pectination at the bases of the bristles.

Maxilla: This limb shows no, or at any rate scarcely perceptible, sex dimorphism. Normal type: The epipodial appendage is large and of about the type shown in Plate XXXV, fig. 13, G. W. Müller, 1894. In all the species, and specimens, examined by me, it had sixteen bristles of about the same type, relative lengths, and positions as in the mentioned figure. At the base of the dorso-anterior bristle, there is a rather small, rounded, lobe-like projection with a dense covering of fine, rather long hairs. The three endites are well developed, rather strong, and usually slightly increasing in length the more distally they are situated. The proximal, or first one, is about as long as high or slightly longer; the distal, or third one, is about twice as long as high or somewhat longer. First endite: With seven distal bristles of moderate length. The dorsal of these, which is situated somewhat proximally to the others, is rather powerful and furnished with fairly numerous long hairs. The others are of moderate strength or rather weak; most of them are more or less curved, non-annulated or almost so, some naked, some furnished with short or long hairs, or deeply bifurcated distally. Second endite: With seven to eight (usually eight) bristles. The number varies within the species; sometimes different even on the right and left maxilla of the same specimen. All these bristles are situated distally, of moderate length and strength, slightly curved, non-annulated or almost so, naked or a few of them have a

few short or rather long hairs. Third endite: With seven distal and subequal bristles of moderate strength and length, which usually are slightly longer than those of the second endite. The dorsal one of them has at about the middle a varying number of long hairs; the others are naked or almost so; or some of them have a few, more or less long hairs. All these bristles are non-annulated or almost so. The palp is two-jointed. The proximal joint is about twice as high as the endites, of subuniform height throughout its entire length and about twice as long as high. The distal joint is about as high as, or somewhat lower than the endites; often slightly higher distally than proximally; and about half as long as the proximal joint or somewhat shorter. The proximal joint of the palp has, dorso-distally, a group of four bristles of moderate strength. One of these bristles is usually about as long as this joint and annulated; in some cases it has short hairs or is almost naked, sometimes it has hairs of moderate length. The other bristles are about half as long, more or less distinctly annulated, and generally furnished with short hairs, almost naked. On the lateral side, this joint has two ventero-distal bristles, which sometimes are attached to a very small scale-like process (corresponding to the exopodite?). One of these bristles is of moderate strength, about twice as long as the end joint or slightly longer, non-annulated or almost so, and furnished with a few short or moderately long hairs. The other is very short and weak, often almost vestigial, and situated dorsally to the first. Distal joint: With three subequal distal bristles of moderate strength. These are usually about twice as long as the end joint, non-annulated, and generally furnished distally with a few hairs of moderate length. The bristles on this limb show a rather great constancy. Indeed, the number seems always to be as described above. In a few specimens a slightly smaller number was found; but in these cases probably one or more bristles had been torn off. It is true that the types and the lengths of the bristles show some variations, especially in the endites; but even in these respects the species examined by me were remarkably constant. In most species there is a longitudinal, more or less dense row of hairs on the lateral side of the first joint of the palp. In a few species some hairs may also be found on the first endite. As

an illustration of this description, reference is made to text fig. VII, 13 of *C. (C.) montereyensis*.

Fifth limb: Without or with but slight sex dimorphism. Normal type: Of moderate strength and length, and with four joints. The relative lengths of the joints are somewhat variable. Sometimes the three exopodite joints are subequal; sometimes the first exopodite joint is more or less distinctly longer than either the second or the third. The protopodite seems always to be somewhat shorter than the exopodite. The number of bristles seems to be perfectly constant; anyhow, in the specimens examined by me no variation was found in this respect. The positions of the bristles seem to be practically constant. The types and relative lengths of the bristles, on the other hand, are somewhat variable; even within the species, some variations have been recorded in this respect. The relative lengths of the bristles is the most variable feature of this appendage. Protopodite: At, or somewhat proximally to, the middle of the anterior side, there are two closely-set bristles of moderate strength, furnished with short hairs. One of these is distinctly annulated and in most cases about as long as the anterior side of the joint; the other is usually about half as long, or somewhat more, and fairly weakly annulated or non-annulated. Antero-distally, i.e., at the knee, there are two annulated bristles, with short hairs, and of moderate strength. The lateral one of these is usually somewhat stronger than the medial one. These bristles which are about as long as, or slightly longer or shorter than, the distal joint, may be subequal, or either of them may be somewhat shorter than the other; this last character is not fully constant even within the species. On the posterior side of this joint, near the proximal boundary, there is a single bristle of moderate strength and length. This bristle often shows sex dimorphism: it is usually short-haired in the male and furnished with long, soft hairs in the female. Exopodite: First joint: With a single ventero-distal bristle of somewhat varying type and length. Usually this bristle is non-annulated, with short hairs, of moderate strength, and about half as long as the second joint or somewhat shorter. The second joint has no bristle. Third joint: This has one bristle, the end claw. This is in most species gently curved, finely pec-

tinated, often almost naked, rather strong, and about one and one-half times as long as the end joint. In the species examined by me I could find no, or at any rate no certain, vestiges of the two other end claws found in the more primitive forms. Although of a rather constant type, the pilosity is subject to variation within most species. Along the proximal half of the posterior side of the protopodite, there seems always to be a number of rather long hairs. Proximoposteriorly, on the outside of this joint, numerous very short and fine hairs usually occur, which often are very difficult to detect even with Reichert's oc.4, Leitz's immers. $\frac{1}{12}$. Some short, stiff hairs are to be found at the bases of the bristles at about the middle of the anterior side of this joint. Distally on this, as well as on the remaining joints, there is usually a fine pectination, in most cases somewhat stronger the more distally the joint is situated, and chiefly developed on the lateral side of the limb. Along the ventral side of the exopodite some short hairs are developed in many species. This last character seems, however, frequently to be variable even within the species. Distally the protopodite has a complicated chitinous support of about the type shown in text fig. VIII, 14 of *C. (C.) montereyensis*. As an illustration of this description, I refer to text fig. VIII, 14 of *C. (C.) montereyensis*.

I have tried, as far as possible, to give accurate and detailed descriptions of all the appendages of the species treated in this paper. There are, however, differences among the species which, for practical reasons, are nearly impossible to describe or to reproduce. Examples of such differences are the thickness of the walls of the joints, and details in the complicated chitinous support at the knees of the last three appendages. It has seemed most convenient to avoid mentioning these details.

Sixth limb: Without or with usually rather slight sex dimorphism. Normal type: Of about the same type as the fifth limb, but slightly larger and generally somewhat more elongated. The relative lengths of the four joints show about the same variability as in the fifth limb. As to the constancy and variability of the bristles, I also refer to the description of the fifth limb. On the anterior side of the protopodite, three bristles are to be found; one somewhat proximally to the middle; one at about, or somewhat distally to, the middle; and

one at the knee. These three bristles are of moderate strength, furnished with short hairs, and annulated; the annulation of the proximal bristle is, however, often rather weak. The lengths of these bristles are somewhat variable; the middle one usually about as long as the anterior side of this joint or somewhat longer; the remaining two generally about half as long or somewhat more. On the posterior side of the protopodite, we find a bristle at about the same place as in the fifth limb. Its type is somewhat variable. In many cases it is different in males and females, being short-haired in the males and furnished with long, soft hairs in the females. The exopodite has the same bristles as in the fifth limb. The bristle of the first exopodite joint is somewhat variable. In the females of some species it has about the same type and size as the corresponding bristle of the fifth limb. In most cases it is, however, slightly longer. In the males it is in most species distinctly weaker than in the female and about as long as or slightly longer or shorter than the second joint. The end claw has about the same type and relative length as in the fifth limb. The pilosity is of about the same type as in the fifth limb; about its variability, see the fifth limb. In most cases there are, however, no long hairs on the posterior side of the protopodite. The pectinations along the distal ends of the joints and also, perhaps, the pilosity on the ventral side of the exopodite seem usually to be somewhat more strongly developed than in the fifth limb. In the distal part of the protopodite there is a complicated chitinous support of about the same type as in the fifth limb. As an illustration of this description, reference is made to text fig. VIII, 15 of *C. (C.) montereyensis*.

Seventh limb: Without or with but slight sex dimorphism. Normal type: Of about the same type as the sixth limb, but somewhat larger and more elongated. As to the variability of the relative lengths of the joints and of the bristles, see the fifth limb. With the same number of bristles and with about the same positions of the bristles as in the sixth limb. The proximal bristle on the anterior side of the protopodite seems always to be small, sometimes even vestigial. The two remaining bristles on this side are well developed, of moderate strength, annulated, and furnished with short hairs. Their

lengths are somewhat different in the various species; and even within many of the species, slight variations are to be found. The bristle on the posterior side of the protopodite has about the same type as the two last-mentioned bristles. Its length is somewhat variable; it is, however, always well developed. The ventero-distal bristle of the first exopodite joint is of somewhat varying types. Usually it has about the same type as the corresponding bristle of the female sixth limb; but in most cases it is slightly longer, being somewhat longer than half the second exopodite joint, but not quite as long as this joint. The pectination of the end claw is usually somewhat better developed than in the sixth limb. The relative length of this claw is generally about the same as in the sixth limb; i.e., about one and one-half times the length of the distal joint. The pilosity is also about the same as in the sixth limb, but the pectination along the distal ends of the joints and the pilosity along the ventral side of the exopodite seem frequently to be somewhat better developed. In the distal part of the protopodite, there is a complicated chitinous support of about the type shown in text fig. VIII, 16 of *C. (C.) montereyensis*. As an illustration of this description, reference is made to the mentioned figure of *C. (C.) montereyensis*.

The chitinous support of the last three limbs, on the sides of the posterior part of the body, has usually about the type reproduced in text fig. IX, 17 of *C. (C.) montereyensis*. I have not found any distinct sex dimorphism in this structure. The support shows rather important variations even within the species. Some of the stripes represented in the mentioned figure may be absent, or some additional ones may be found. Also, the shapes of the different stripes frequently are somewhat different in the various specimens. I have not considered it worth while to note and reproduce these variations. They appear to be of little or no systematic value.

Brush-shaped organ: This organ seems to be subject to but slight variation within the subgenus. It is of moderate length and width, usually subequal in width throughout its entire length, rarely somewhat wider distally than proximally, straight or almost so, and furnished distally with a great number of subequal, soft bristles. The number of these bristles

appears to be somewhat different in the various species. The number is, however, almost impossible to state with certainty, even when the appendage is observed crushed under the cover glass. Thus no definite statements of this character are given in my descriptions; and my figures of this organ should in this respect be considered as generalized.

Penis: This organ shows so great differences in the species examined by me, that it seems best to postpone a subgeneric description. Within each species, on the other hand, it appears to be characterized by a very great constancy.

Genital verruca of the female: This has the same type on the right and the left sides of the body and is subject to very slight variation within the subgenus. Normal type: Rounded to slightly oval. The shape is somewhat altered by the pressure of the cover glass; and when the organ is examined without any cover glass being used, it often is seen in a more or less slanting position. With a bundle of four to several (different in the various specimens of the same species) narrow muscles attached close by (and to?) the distal part of the duct and along the posterior side of the verruca. The duct opens on the anterior-medial side of the verruca. It runs almost straight up into the body and does not form any coil within the verruca. As an illustration of this description, I refer to text fig. IX, 19 of *C. (C.) montereyensis*.

Furca:

Female: Subject to but slight variation within the subgenus. It consists of two rather small verrucae, located just inside, or just behind, the two genital verrucae. Distally each furcal verruca has two plumose bristles. The posterior one of these is moderate in length; the anterior frequently is about half as long or somewhat more. On the posterior medial sides, the furcal verrucae are frequently furnished with fine and rather long hairs. As an illustration of this description, reference is made to text fig. IX, 19 of *C. (C.) montereyensis*.

Male: In this sex the furca consists, on each side of the body, of two bristles which have about the same type as in the female; i.e., just as in the female the posterior of these two bristles is usually somewhat longer than the anterior. In ad-

dition to these two bristles, there is, in nearly all species (only the exceptions are mentioned in the following descriptions of species), a short, almost vestigial, narrow, naked, medial bristle. The furcal verrucæ are very small in most species, hardly distinguishable.

The posterior part of the female body is short and more or less rounded. The posterior extremity has a short bristle usually situated on a process, which appears verruciform when the body is examined from the side [text fig. IX, 19 of *C. (C.) montereyensis*]. The back of the posterior part of the body is sometimes furnished with short spines, either arranged in more or less irregular transverse rows [text fig. IX, 19 of *C. (C.) montereyensis*], or irregularly distributed.

Lips: Without sex dimorphism—Of nearly the same types in all the species of this subgenus described in this paper. The upper lip is helmet-shaped, with a rather strongly rounded anterior margin, when examined from the side. It is bordered proximally by a transverse chitinous strip. The lateral parts of this strip, which usually are somewhat stronger than the middle part, are united to the latter by flexible joints. From each of these two joints a rather strong chitinous strip descends to the antero-ventral edge of the lip. Each of these two strips is evenly and well curved, concave ventrally; and its ventral half is somewhat strengthened and furnished with a rather dense series of stiff and fairly long hairs. Somewhat dorsally to these two strips, and about parallel to them, another pair of chitinous strips is to be found. This pair also issues from the above-mentioned transverse strip and runs at a rather great distance from the median line of the lip towards the antero-ventral edge of the lip, which it, however, never seems to reach. This pair is rather weak and may even be absent. In most species an irregular chitinous bar occurs along the dorsal edge of the mouth. Above the upper lip there is an A-shaped chitinous support, attached to the transverse strip by flexible joints at the points where the lateral and medial parts of the transverse strip meet. Rarely the cross-bar of the A is absent. Between the dorsal pair of longitudinal chitinous strips of this lip, there are two transverse

groups of fine hairs, the ventral group often discontinuous in the middle. As an illustration of this description, see Plate III, figs. 4 and 5. The lower lip is characterized by a rather large, boat-like, unpaired appendage, on the ventral side of which a varying number of soft, rather long hairs are to be found. On either side, and in front, of this, some rather small and somewhat irregular lobes are developed, more or less richly furnished with fine hairs. As an illustration of this description, reference is made to text fig. XIX, 6 of *C. (C.) glauca*.

The chitin of the body is, generally speaking, characterized by a more or less distinct yellowish color.

The type species of this subgenus, and thus also of the genus as a whole, is one of the species of *Cythereis* described by Jones (1849).

Arrangement of the species: The species of this subgenus treated in this paper have been divided into six groups, viz., the *Montereyensis*, *Tacniata*, *Discophora*, *Frequens*, *Ephippiata*, and *Glauca* groups. All these groups are characterized especially by the shape and structure of the penes.

Montereyensis Group nov.

Two of the species described in this paper belong to this group, viz., *C. (C.) montereyensis* and *pacifica*.

C. (Cythereis) montereyensis, new species

Plate III, figs. 4, 5, 8; Plate VI, figs. 1 and 2; text figs. VI to IX.

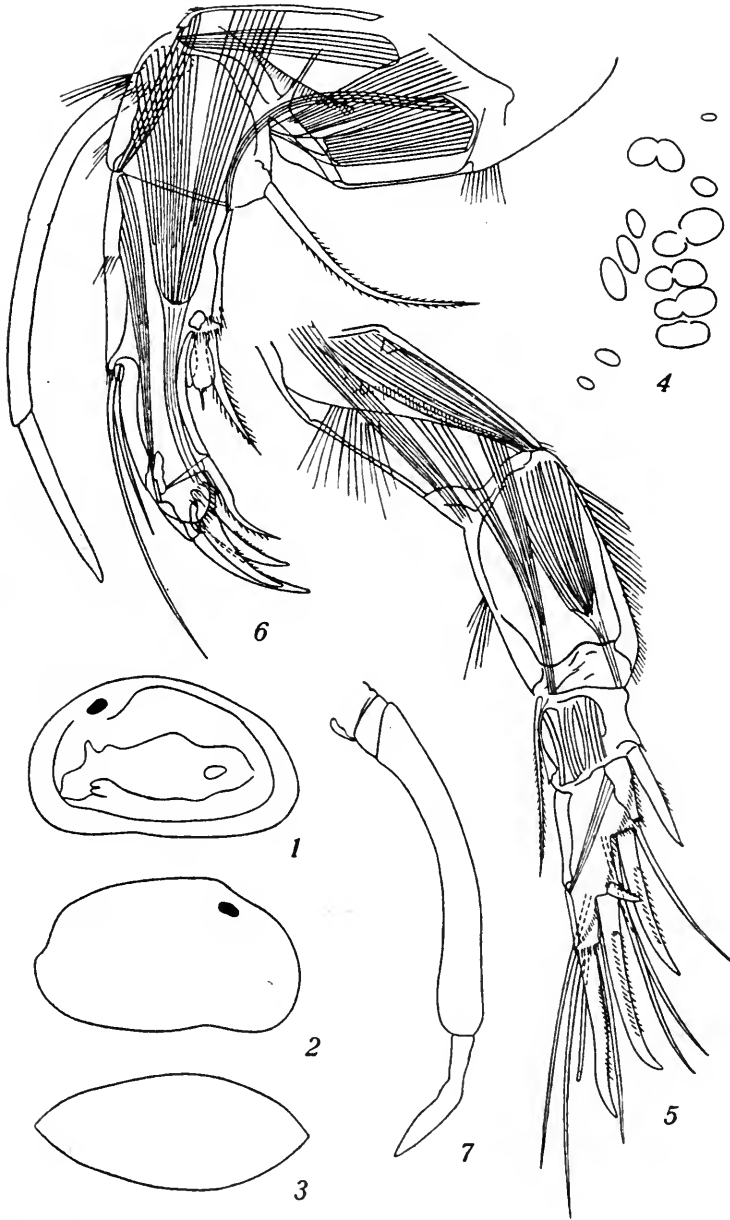
Description: Male—

Shell: Length, 0.63-0.65 mm.; length: height, about 1.70-1.80:1; length: breadth, about 2.1-2.3:1. Seen from the side and from below, of the same shape as in *Cythereis kerguelensis* (G. S. Brady). (Compare G. S. Brady's "Challenger" Report, 1880, Plate XX, fig. 1a-1f and my text fig. VI, 1-3 of this species; male and female are similar.) Left valve somewhat larger than right; difference in size varies, sometimes very slight, sometimes rather conspicuous. As to the differences between shapes of the two valves, compare my figures; shape not perfectly constant, variations, however,

rather slight. Margin of shell usually nearly smooth, sometimes, however, a few more or less distinct teeth along the postero-ventral part of shell. Sculpture of surface of shell somewhat variable; in specimens examined it is about as follows: Entire surface has numerous, usually more or less rounded depressions of somewhat different sizes, some depressions being more or less small, others of moderate size (Pl. III, fig. 8). Arrangement of depressions rather irregular; some depressions, especially near margin of shell, arranged in more or less distinct rows of different lengths which either run in various directions or, and this seems to be the rule, more or less parallel to margin of shell; in middle of shell most of the depressions are scattered quite irregularly. Near margin of shell cavities are usually very closely set, especially on posterior part of shell (Pl. III, fig. 8); near middle of shell, on the other hand, they are in most cases distinctly more widely spaced. Somewhat inside ventral margin of shell, there is a low, in some specimens hardly distinguishable ridge, often characterized by a single, rather distinct row of rounded to elongated depressions of different sizes. (As to the position of this ridge, see G. S. Brady's [1880] figures of *C. kerguelenensis*, mentioned above.) Along ventral margin of shell, there is also a low, smooth ridge, which partly covers edge of shell when this is observed from the side. With regard to variations of sculpture, see description of female shell. Pores of surface moderate in number but rather conspicuous; some have rather short bristles. Along anterior margin and along anterior part of ventral margin of shell, there are about 50 to 60 lanceolate, hyaline bristles, furnished with marginal hairs; along posterior part of ventral margin and along ventral part of posterior margin, there are about 20 to 32 similar bristles; some ordinary bristles also occur among these bristles (Pl. III, fig. 8). When seen by transmitted light, the part of shell which lies inside line of concrescence is reddish; outside this line, shell is almost uncolored. It is to be noted that the central part of shell, indicated in text fig. VI, 1 by an irregular line, is rather strongly incrustated with lime; by transmitted light this area is rather dark, by reflected light milkish white. This area somewhat variable in shape; usually,

Text fig. VI. *Cythereis (Cythereis) montereyensis*, n. sp., not type.

1. Left valve from the side, ♀. ×56.
2. Right valve from the side, ♀. ×56.
3. Shell from above; anterior end to the left, ♂. ×58.
4. Muscle spots of right valve from the medial side; the two small spots located low and to the left are antero-ventral in position, ♂. ×175.
5. Right first antenna from the lateral side, ♂. ×425.
6. Left second antenna from the medial side, ♂. ×425.
7. Exopodite of second antenna, ♀. ×425. California, Carmel Bay.



however, about as shown in text fig. VI, 1; in its posterior part, it has generally a small window, if I may say so, in which incrustation is less developed.

First antenna (text fig. VI, 5): Slightly stronger and shorter than usual. Relative lengths of joints about as follows:

$$\text{I. } \frac{10}{14} \quad \text{II. } \frac{13}{10} \quad \text{III. } \frac{3}{4} \quad \text{IV. } \frac{7}{5} \quad \text{V. } \frac{2.5}{3}$$

Somewhat dorsally to half the height of first joint, there is, laterally, a longitudinal row of short hairs. On inner side of this joint there is a rather dense row of hairs of different lengths, most of them of moderate length, running in a curve from a point somewhat dorso-distally to proximo-ventral corner of joint to, or nearly to, dorso-distal corner of joint; length of this row variable.

Second antenna (text fig. VI, 6): Slightly stronger and shorter than usual. Exopodite slightly stronger than in most species of this subgenus. Endopodite: Posterior bristle of first joint about as long as posterior side of second joint. Second joint: The postero-lateral one of the three bristles on posterior side of this joint has a strong pectination; the medial one of these bristles is about half as long as the postero-lateral, broadly claviform, when seen from the side, with thick walls, naked or almost so, and furnished distally with a narrow spine; spine frequently about half as long as claviform part. Distal lamellæ of this joint somewhat larger than in most species of this subgenus. On medial side of protopodite there is a longitudinal row of fine hairs.

Mandible (text fig. VII, 9-12): Masticatory joint—On toothed edge of pars incisiva the next to the posterior pair of teeth is very small, almost vestigial. On anterior side of dorsal half of this joint there is a rounded hump.

Maxilla (text fig. VII, 13♀): The long one of the four dorso-distal bristles on the first joint of the palp usually has hairs of moderate length.

Fifth limb: Relative lengths of joints about as follows:

$$\text{Protopodite } \frac{10-11}{13.5-14.0} \quad \text{Exopodite I. } \frac{6}{7.5} \quad \text{II. } \frac{7}{5.5} \quad \text{III. } \frac{6}{5.5}$$

Protopodite: Bristle on posterior side about as long as distal joint, of moderate strength, not or but slightly swollen at

base, more or less distinctly annulated, and furnished with short hairs. End claw with pectination of moderate strength.

Sixth limb: Relative lengths of joints of this limb usually about as follows (scale the one used in fifth limb):

$$\text{Protopodite } \frac{12}{15} \quad \text{Exopodite I. } \frac{7}{9.5} \quad \text{II. } \frac{7.5}{6.5} \quad \text{III. } \frac{7}{6}$$

Of the three bristles on anterior side of protopodite joint, the middle one usually distinctly longer than anterior side of joint; the two others about half as long or somewhat more; bristle on posterior side of this joint of about same type and relative length as in fifth limb of male. Bristle on the first exopodite joint rather weak, often almost naked, and about as long as or slightly shorter than second exopodite joint. End claw slightly stronger than that of fifth limb; its pectination of moderate strength.

Seventh limb: Relative lengths of joints usually about as follows (scale the one used in fifth and sixth limbs):

$$\text{Protopodite } \frac{12-13}{15-16} \quad \text{Exopodite I. } \frac{9.5-10.5}{11-12} \quad \text{II. } \frac{8}{6} \quad \text{III. } \frac{7}{6.5}$$

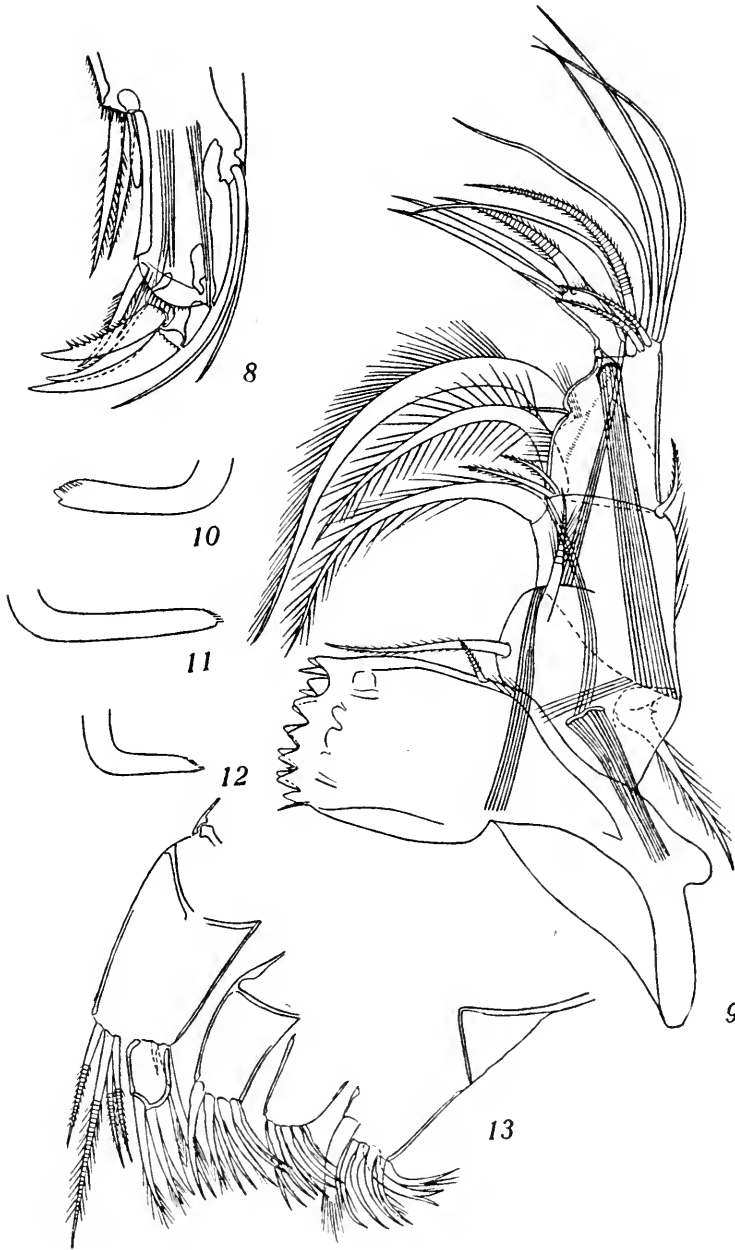
Thus mainly first exopodite joint is more elongated than in sixth limb. Protopodite: Proximal bristle on anterior side of joint vestigial and almost impossible to detect among a number of short hairs; the middle one of bristles on this side rather long, being about as long as this side, or even somewhat more; bristle at the knee about half as long as last-mentioned bristle, or slightly more; bristle on posterior side of this joint relatively long, being about as long as anterior side of joint, or somewhat shorter. Bristle on first exopodite joint of about same type and relative length as corresponding bristle of female sixth limb, or slightly longer.

Brush-shaped organ (text fig. IX, 18): About three to four times as long as wide, of subuniform width throughout its entire length. With a slanting row of short and very fine hairs somewhat distally to middle of organ; this row very difficult to detect even with Reichert's oc.4, Leitz's immers. $\frac{1}{12}$. Distally this appendage has about thirty to forty bristles which are about as long as appendage, or slightly longer.

Penis (Pl. VI, fig. 1): Apparently very constant in shape and structure. Vas deferens has spiral thickenings.

Text fig. VII. *Cythereis (Cythereis) montereyensis*, n. sp., ♀, not type.

8. Distal part of endopodite of right second antenna from the lateral side. ×425.
9. Right mandible from the medial side. ×520.
- 10, 11. Bristles just behind anterior tooth of the pars incisiva of the mandible. ×1335.
12. Bristle just behind the next anterior tooth of the pars incisiva of the mandible. ×1335.
13. Distal part of the right maxilla from the medial side; somewhat crushed. ×640. California, Carmel Bay.



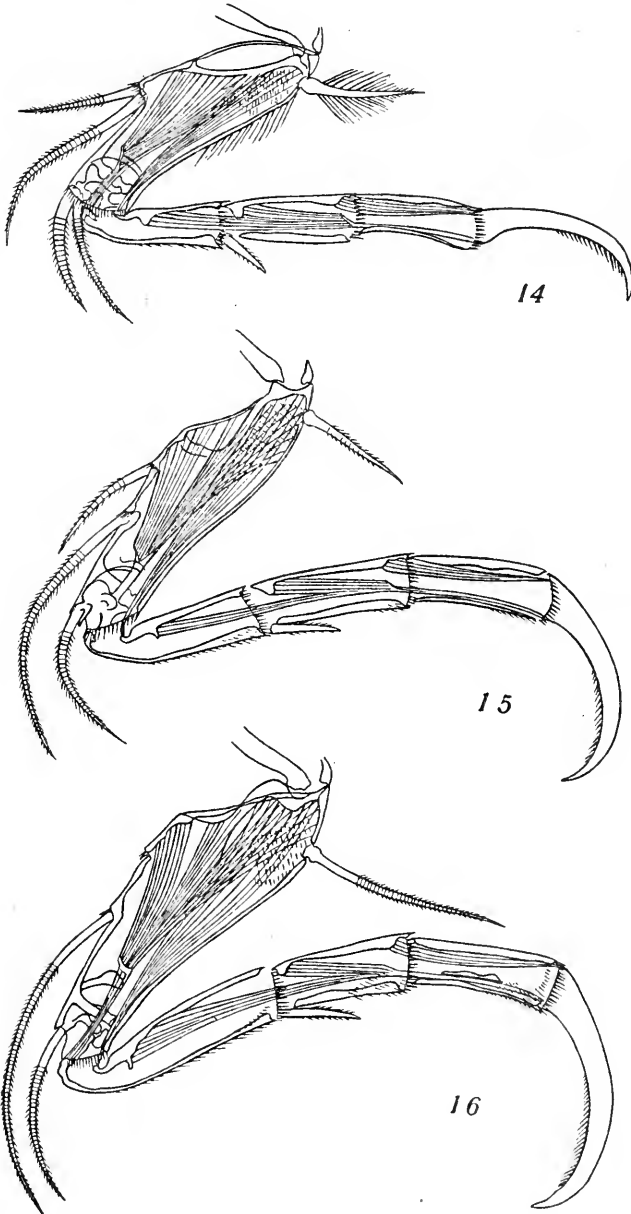
Ductus ejaculatorius has a very long, free tube, bent and curved in a characteristic way; its distal part narrow and whip-like. Copulatory appendage rounded distally and has a decided ventral notch; this appendage has about same type and size in both penes. Penes of small specimens (see below) differed from those of the large mainly in having ductus ejaculatorius kept in a spiral; each spiral with about three coils. For further differences between penes of the large and the small specimens, e.g., in copulatory appendage, reference is made to a comparison between Plate VI, fig. 1 and Plate VI, fig. 2.

Description: Female—

Shell: Length varies usually between 0.64 and 0.67 mm., but some specimens, measuring only 0.58 to 0.60 mm., were found. Length: height, usually about 1.60 to 1.65:1; the small specimens, however, somewhat higher relatively, their ratio being about 1.55 to 1.57:1. Length: breadth, about 2.1-2.2:1. Seen from the side and from below of about same shape as in male. Sculpture of surface in most cases also about same in the two sexes; it seems, however, to be subject to greater variations in female. In some specimens most of the depressions were of moderate size and either irregularly scattered over entire surface, or partly arranged in rows more or less distinctly parallel to margin of shell. In some of these specimens two additional, though rather low, ridges were developed, one somewhat inside dorsal part of anterior margin of shell, the other inside posterior part of dorsal margin of shell. When seen from above, shells of these specimens had somewhat broader extremities than in text fig. VI, 3. The small specimens, mentioned above, were all characterized by the fact that most of the depressions were of moderate size. In other respects female shell agreed with that of male.

Second antenna (text fig. VI, 7 and text fig. VII, 8): The medial one of the three bristles at about middle of posterior side of second endopodite joint usually somewhat longer than in most of the other species of this subgenus, and it has a strong pectination just as the postero-lateral one of these bristles.

Fifth limb (text fig. VIII, 14): Bristle on posterior side of protopodite has about same length as in male, but it is non-



Text fig. VIII. *Cythereis (Cythereis) montereyensis*, n. sp., ♀, not type.

14. Left fifth limb from the lateral side. $\times 355$.

15. Left sixth limb from the lateral side. $\times 355$.

16. Left seventh limb from the lateral side. $\times 355$. California, Carmel Bay.

August 24, 1928

annulated, swollen at base, fine distally, and along greater part of its length it is covered with long, soft hairs.

Sixth limb (text fig. VIII, 15): This differs from that of male in having bristle on first exopodite joint of about same type and strength as corresponding bristle of fifth limb and about half as long as second exopodite joint or slightly longer. (Bristle on posterior side of protopodite thus of same type in both sexes.)

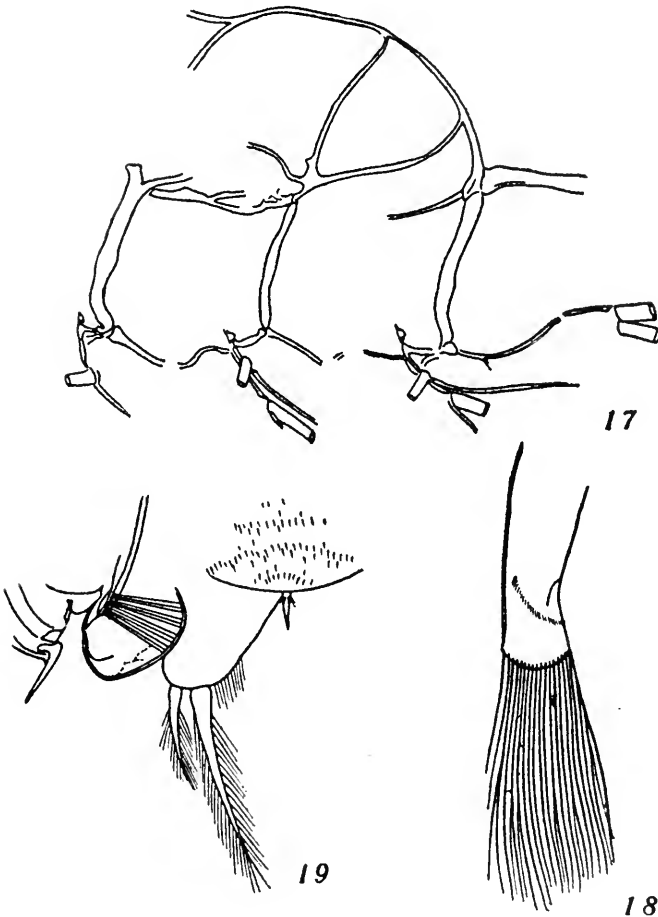
Seventh limb (text fig. VIII, 16): Of about same type as in male.

Posterior part of the back of body has irregular transverse rows of short spines (text fig. IX, 19).

Remarks: As will be seen from the description given above, the sculpture of the shell of this species is subject to rather pronounced variations, especially in the females. The size and the shape of the shell are also rather variable. The remaining organs, on the other hand, are very constant, and it seems probable that the species, in its present scope, represents a natural systematic unit. This assumption is supported by the fact that specimens of different types of shell were found together in nature. (Compare G. W. Müller, 1894, p. 367.)

Among the specimens taken at Carmel Bay and at Pacific Grove, three (and an empty shell) measured only 0.52 mm. in length. These specimens were first considered to be larvæ in the first stage ($0.52 \times 1.21 = 0.629$; see my paper of 1920, p. 146). Indeed, their lengths agreed perfectly with that of the first larval stage of the other species of this subgenus in which the mature specimens measured about 0.60 to 0.67 mm. in length. When examined, these three specimens proved to be males of mature type and of almost perfectly the same structure as the mature males described above. The free tube of the ductus ejaculatorius, however, was kept in a spiral, which is probably a sign that it had not been used. It seems to me beyond doubt that these specimens should be assigned to the species described above. Were they mature, or did they belong to the first larval stage?

All organs were closely examined in four mature males and three mature females. The shell was measured and examined in all the specimens taken.



Text fig. IX. *Cythereis (Cythereis) montereyensis*, n. sp., not type.

17. Chitinous support of the fifth, sixth, and seventh limbs, on the right side of the posterior part of the body. Parts below the three simple, subvertical bars belong to these limbs. Fifth limb to the right. Of the proximal bristles of these limbs, only the basal parts are drawn, ♀. $\times 355$.
18. One of the brush-shaped organs; the number of bristles too small, ♂. $\times 1165$.
19. Posterior part of body from the left; somewhat pressed under the cover glass; posterior extremity seen from behind. What is to the left of the genital verruca belongs to the seventh limb, ♀. $\times 425$. California, Carmel Bay.

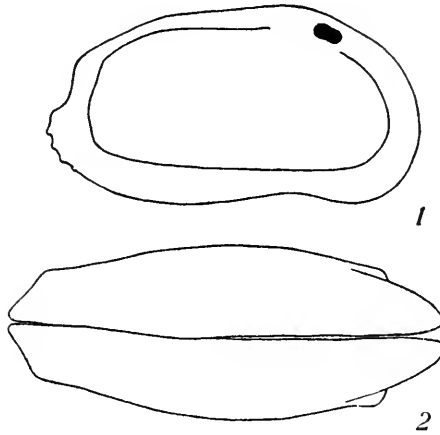
Habitat: California; Carmel Bay (type locality)—In tide pool among roots of eelgrass; 23.XI.1920: Eighteen specimens, two of which were males only 0.52 mm. long. At same locality and on same occasion: Two specimens on holdfasts of *Macrocystis*. At same locality, among holdfasts of various sea-weed; 20.I.1921: Two females and one small male (length, about 0.52 mm.). Pacific Grove, just outside Hopkins Marine Station: In tide-pool on calcareous algæ: 17.XI.1920: Two females. On roots of eelgrass in tide-pool, 23.XI.1920: One female and one small male (length, 0.52 mm.). On holdfasts of *Macrocystis*; depth, 2 m.; 28.I.1921: One female. All specimens of mature structure and collected by the author.

C. (*Cythereis*) *pacifica*, new species

Plate III, fig. 1; Plate VI, fig. 3; text fig. X.

Description: Male—

Shell (Pl. III, fig. 1): Length, 0.60 to 0.64 mm.; length, height, about 1.68-1.75:1; length: breadth, about 2.43-2.50:1. Seen from the side: Left valve; subreniform, with greatest height somewhat in front of middle, and with anterior part distinctly larger than posterior. Dorsal margin, which is evenly and moderately arched, slopes gently posteriorly; anterior margin smooth. Posterior extremity of valve produced somewhat below middle in a distinct, subrectangular, well rounded beak; dorsal part of posterior margin of valve straight to very slightly sinuated; it forms with dorsal margin a broadly rounded, obtuse, but distinct corner. Ventral margin somewhat sinuated in front of middle and slightly arched posteriorly; it joins posterior margin without forming any corner. On ventral part of posterior beak-like process of valve and just antero-ventrally to this, margin is often fringed with about four to six more or less strong teeth. Right valve (text fig. X, 1) differs from the left valve mainly in the following respects: Somewhat smaller; angle above eye more distinct on account of the fact that dorsal part of anterior margin is more depressed. Dorsal part of posterior margin rather strongly sinuated, sometimes even slightly more than in the accompanying figure; this makes dorsal corner of beak-



Text fig. X. *Cythereis (Cythereis) pacifica*, n. sp., ♂.

1. Right valve from the side, type. $\times 81$.
2. Shell from below; front end to the left (not type). $\times 95$.
Pacific Grove, California.

like process and postero-dorsal corner of valve more pronounced. Ventral margin more sinuated in front of middle. Seen from below (text fig. X, 2): Widest at or just behind middle; posterior part of shell about as large as or but slightly larger than anterior. Gently and evenly convex in middle; nearly straight to slightly concave in front of middle; on each valve with an obtuse, rounded angle near anterior extremity; behind middle side contours form an evenly rounded curve which is broken somewhat in front of posterior extremity by a slight projection (caused by postero-dorsal ridge); posterior extremity narrowly rounded. Sculpture of surface rather constant. Somewhat inside of, and about parallel to, anterior margin, there is a rather broad and low, rounded ridge which runs from eye to a point somewhat below middle of shell; near middle of anterior margin it has a short, low, and spur-like posterior continuation. Ventral ridge one-sided and rather low; its ventral slope is more or less concave, it continues along entire ventral margin of shell, and ends at postero-ventral beak-like process. On posterior half of shell another one-sided but more marked ridge runs at some distance from, and about parallel to, dorsal margin and dorsal part of pos-

terior margin of shell; it forms a distinct but rounded corner inside postero-dorsal corner of shell, and its dorsal and posterior slopes are always steep; as far as my experience goes, it never joins ventral ridge, and it seems always to be more or less distinctly bifurcated anteriorly. Just behind eye there is, in most cases, a low, short ridge which runs slantingly upwards and backwards. Antero-dorsal quadrant of shell, inside the ridges, covered with rather numerous, small, rounded depressions, usually arranged in five to six more or less irregular rows running slantingly upwards and backwards. In antero-ventral quadrant, inside the ridges, five to six similar rows occur running more or less parallel to ventral ridge. In postero-dorsal quadrant, inside the dorsal ridge, there are two longitudinal rows of rather large and deep depressions, about five depressions in each row (posterior depression considered to belong to ventral row); some of these depressions divided into two or more smaller depressions. In postero-ventral quadrant, inside the ridges, a number of rather large and deep depressions are to be found, usually arranged in about the way shown in Plate III, fig. 1; their sizes, number, and arrangement, however, subject to some variation. Dorsal and ventral quadrants separated by a longitudinal zone, which either is almost smooth, or is covered with rather widely-spaced, scattered and small depressions. Anterior and postero-dorsal ridges in most specimens almost smooth. Outside the ridges surface of shell either nearly smooth, or it is covered with scattered depressions of different sizes and number; along dorsal margin of shell, however, depressions are more or less distinctly arranged in rows; these rows usually not quite so regular as in the figure. Hairs along margin and color of shell about as in *C. (C.) montereyensis*. No dark fields are to be detected, when shell is regarded by transmitted light (of course, with the exception of ridges and zone between dorsal and ventral quadrants).

First antenna: Fourth joint somewhat more elongated than in *C. (C.) montereyensis*, being about $\frac{9}{7}$, expressed in scale used in description of the subgenus. No longitudinal rows of hairs seem to occur on first joint.

Second antenna: Of about same size and strength as in *C. (C.) montereyensis*. Endopodite: Posterior bristle of

first joint almost as long as posterior side of second joint. Second joint: The group of three bristles on posterior side of this joint situated slightly more proximally than in *C. (C.) montereyensis*; its postero-lateral bristle furnished with rather strong pectination; the remaining two bristles of this group have about same types and sizes as in *C. (C.) platycopa*; the sensorial one, however, somewhat smaller. In some specimens there seems to be no longitudinal row of hairs on medial side of protopodite.

Mandible: On toothed edge of pars incisiva, the next to the posterior pair of teeth is very small. There is a rounded hump on anterior side of dorsal half of masticatory joint. The row of hairs on medial side of second endopodite joint seems to be represented only by a small group of hairs of moderate length somewhat proximally to distal boundary of joint.

Maxilla: The long one of the four dorso-distal bristles of first joint of palp has short hairs or is almost naked.

Fifth limb: Relative lengths of joints about same as in *C. (C.) montereyensis*. Walls of joints sometimes not quite so strong as in this species. Types and relative lengths of bristles about as in male of the mentioned species; end claw, however, finely pectinated.

Sixth limb: Relative lengths of joints and types and relative lengths of bristles about as in *C. (C.) montereyensis*; pectination of end claw, however, very weak.

Seventh limb: Of about same type as in *C. (C.) montereyensis*; long bristles of protopodite, however, as a rule, slightly shorter relatively.

Brush-shaped organ: Of a type intermediate between that of *C. (C.) montereyensis* and that of *C. (C.) platycopa*.

Penis (Pl. VI, fig. 3): Vas deferens with spiral thickening. Ductus ejaculatorius has a free tube of moderate length and somewhat S-shaped type. Copulatory appendage fairly large, of about same shape on both penes, rounded distally, with ventral notch near distal end.

Description: Female—

Shell: Length, about 0.61 to 0.65 mm. Similar to that of male, but slightly higher and broader relatively; sometimes it agrees even in these respects with male shell.

Second antenna: The medial one of the three bristles at about middle of posterior side of second endopodite joint seems usually to be less strongly pectinated than postero-lateral bristle of this group.

Fifth limb: Types and relative lengths of bristles about same as in *C. (C.) montereyensis*, ♀.

Sixth limb: Types and relative lengths of bristles about same as in *C. (C.) montereyensis*, ♀; pectination of end claw, however, rather weak.

Seventh limb: Of about same type as in male.

Genital verruca and posterior part of body about as in *C. (C.) montereyensis*.

Remark: All organs carefully examined in three males and two females; shells of all recorded specimens examined.

Habitat: **California; Pacific Grove**, just outside Hopkins Marine Station (type locality)—In tide-pool, on calcareous algæ; 17.XI.1920: One mature male (dead, when taken). On holdfast of *Macrocystis*; depth, about 2 m.; 23.XI.1920: Four dead mature specimens, seven living mature specimens, and four juvenes, 0.52 to 0.54 mm. long. **Carmel Bay**: On holdfasts of kelp near shore; 23.XI.1920: One dead mature male and two living females. In tide-pool, on roots of eel-grass; 20.I.1920: Three dead mature specimens. Males and females occurred in about equal number; all specimens taken by the author.

Tæniata Group nov.

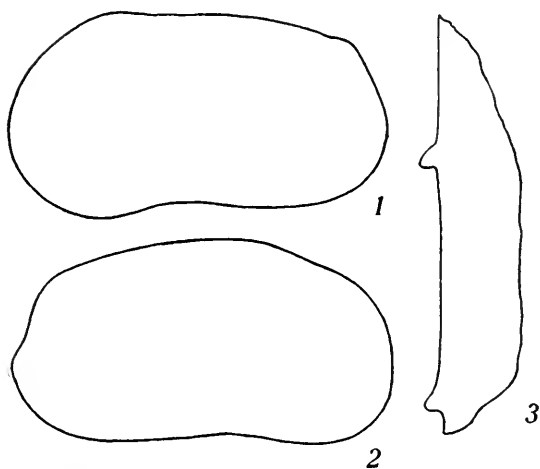
This group comprises *C. (C.) tæniata*, *tæniata* var. *deliciosa*, and *longiductus*.

C. (Cythereis) tæniata, new species

Plate I, fig. 6; Plate IV, fig. 5; text fig. XI.

Description: Male—

Shell: Length, 0.61 to 0.63 mm.; length: height, about 1.8:1; length: breadth, about 2.6:1. Seen from the side: Left valve (text fig. XI, 1): Greatest height situated somewhat in front of middle, at about anterior hinge-tooth; valve, however, only slightly higher anteriorly than posteriorly. An-



Text fig. XI. *Cythereis (Cythereis) tæniata*, n. sp., ♂, type.

1. Left valve from the side. $\times 82$.

2. Right valve from the side. $\times 82$.

3. Left valve from above. $\times 90$. Falkland Islands, S. A. E., station 46.

terior margin without teeth or crenulation. Posterior margin forms almost an arc with posterior part of ventral margin, its dorsal half flattened, almost straight; without distinct teeth or serrulation, sometimes, however, somewhat uneven. Dorsal margin gently arched, with slight sinuation just behind anterior hinge-tooth and in front of posterior hinge-socket; it slopes gently posteriorly and forms with posterior margin a distinct but broadly rounded corner. Ventral margin somewhat sinuated in front of middle, its posterior half almost straight. Right valve (text fig. XI, 2): This differs from left mainly in the following respects. Sometimes of about same size as the left, but in many specimens distinctly lower (length: height, sometimes about 2:1). Anterior margin somewhat more flattened dorsally, and dorsal part of posterior margin slightly sinuated. Dorsal margin without the slight sinuation just behind anterior and just in front of posterior hinge-tooth. Outlines of the two valves not constant, variations from type described above, however, rather slight. Seen from above (text fig. XI, 3): Outline somewhat irregular;

sides sub-parallel, converging gently towards anterior and rather abruptly towards posterior extremity; anterior extremity somewhat pointed, posterior irregularly rounded. Sculpture of surface rather constant; slight variations, however, to be noted in number, shapes, sizes, and development of depressions, as well as in development, shapes, and positions of main ridges. Just inside, and about parallel to, anterior margin of shell, there is a low and rather narrow ridge. Ventral ridge fairly low; indeed, along posterior half of ventral margin of shell, it frequently is not developed at all. At a rather great but somewhat varying distance from posterior margin of shell and more or less parallel to this, there is a one-sided ridge, usually rather distinct and sometimes fairly straight, sometimes more or less sinuated inside middle of posterior margin of shell; this ridge continues along posterior half of dorsal margin, which it does not cover when shell is observed from the side; at about middle, this posterior ridge has a low and fairly narrow, spur-like continuation, which runs about parallel to longitudinal axis of shell to a point somewhat behind middle of shell. This spur furnished with a row of rather small excavations, either simple or divided into two to five small pits. Rest of surface covered with closely-set, angular excavations of moderate size and depth; excavations just above the noted spur-like zone arranged in two rows parallel to longitudinal axis of shell; the others are situated more or less irregularly. Bottoms of most of these excavations marked by a somewhat varying number of small pits. Among the hairs along anterior margin and along anterior part of ventral margin of shell, some are of the ordinary narrow, simple type, some (about twenty to twenty-eight) are hyaline, flattened, leaf-like, and either with smooth edges or with very short and fine hairs along one edge. Along posterior part of ventral margin and along posterior margin of shell, there is a number of rather short bristles; nearly all of these are of ordinary, simple, narrow type, or some of them are slightly flattened. When seen by transmitted light, shell is brownish (specimens preserved in alcohol); when dried and seen by reflected light, it is porselaneous. No dark areas are to be detected, when shell is observed by transmitted light (of course, with the exception of ridges).

First antenna: Fourth joint slightly more elongated than in *C. (C.) montereyensis*, being about $\frac{7.5}{6}$, expressed in scale used in description of the subgenus. Bristle in front of proximal claw of fourth joint about one-quarter to one-sixth shorter than this claw. On medial side of first joint there is a row of hairs of about same type as in *C. (C.) montereyensis*; on lateral side of this joint there seems to be no longitudinal row of hairs; long hairs on anterior side of second joint somewhat less numerous than in the mentioned species.

Second antenna: Second endopodite joint: All bristles of this joint have about same position as in Plate XXXV, fig. 19, G. W. Müller, 1894. Those at the middle of posterior side of this joint have about same types as in female; the medial and postero-lateral ones of them have rather fine pectination. The strong postero-distal bristle on this joint is relatively weak and very finely pectinated. Distal plates of this joint rather small, with fine pectination on medial side of appendage and pectination of moderate strength on lateral side. At base of distal claw of end joint, no spines, or only very weak, scarcely distinguishable, spines are developed. On medial side of the propodite there is a row of hairs as in *C. (C.) montereyensis*.

Mandible: On toothed edge of pars incisiva of masticatory joint, the next to the posterior pair of teeth is about as large as adjoining pairs. There is no rounded hump on anterior side of dorsal part of this joint. The row of hairs on medial side of second endopodite joint seems, at least sometimes, to be made up of hairs somewhat longer than in text fig. VII, 9 of *C. (C.) montereyensis*.

Maxilla: The long one of the four dorso-distal bristles of first joint of palp seems usually to be furnished with hairs of moderate length.

Fifth limb: Of about same type as in *C. (C.) montereyensis*, ♂.

Sixth limb: Of about same type as in *C. (C.) montereyensis*, ♂. The middle one of the three bristles on anterior side of propodite about as long as this side. Bristle of first exopodite joint about as long as to slightly longer than second joint.

Seventh limb: Of about same type as in *C. (C.) glauca*, ♂. Bristle on posterior side of protopodite sometimes about one-half as long as in text fig. VIII, 16 of *C. (C.) montereyensis*.

Chitinous support of these three limbs, on sides of posterior part of body, usually somewhat stronger than in *C. (C.) montereyensis*.

Brush-shaped organ: Of about same type as in *C. (C.) montereyensis*, but somewhat broader and more rounded distally than in figure 18 of this species.

Penis (Pl. IV, fig. 5): Vas deferens with spiral thickening. Free tube of ductus ejaculatorius of moderate length and extends to about distal point of copulatory appendage. Copulatory appendage has a narrow, beak-like postero-ventral projection, which is narrowly rounded distally; its anterior part, which is somewhat variable in shape, is obliquely rounded and somewhat truncated distally; in right penis its distoventral extremity is bent in, and under the cover-glass it is pressed against inner side of appendage (always?).

Description: Female—

Shell: Length, 0.61 to 0.64 mm.; length: height, about 1.7:1. Seen from the side of about same shape as in male, but slightly higher relatively and with slightly more arched dorsal margin. Seen from above slightly broader relatively and with less flattened sides than in male. In other respects about as in male (Pl. I, fig. 6).

Second antenna: Protopodite and endopodite about as in male.

Fifth limb: Of about same type as in *C. (C.) montereyensis*, ♀.

Sixth limb: Of about same type as in *C. (C.) montereyensis*, ♀, but bristle on posterior side of protopodite of about same type and size as corresponding bristle of fifth limb; and the middle one of the three anterior bristles of this joint about as long as anterior side of this joint.

Seventh limb: Of about same type as in *C. (C.) glauca*, ♀.

Genital verruca and posterior part of body about as in *C. (C.) montereyensis*, ♀; the former slightly flattened postero-ventrally; the latter almost lacks spines, and the bristle of its posterior extremity situated on a rather small, rounded process.

Remark: Two males, two females, and the shells of all the recorded specimens were examined.

Habitat: Falkland Islands—S.A.E., Station 46, **Port Louis, Carenage Creek**, lat. 51° 32' S., long. 58° 7' W. (type-locality); 9.VIII. 1902; depth, 1 m.; sand with *Codium*: Three mature males and eighteen mature females. S.A.E. Station 51, **Port William**; 3.IX. 1902; depth, 22 m.; sand: Two mature males.

C. (Cythereis) tæniata, new species var. **deliciosa**, new var.

Plate I, fig. 7.

Description: Female—

Shell (Pl. I, fig. 7): Length, 0.69 mm.; length: height, about 1.72:1; length: breadth, about 2:1. Seen from the side of about same shape as in *C. (C.) tæniata*, ♀. Seen from above also of about same shape as in this species; however, not so much flattened at the sides, but with fairly well arched outline in middle (about as in plate 20, figure 3b, *Cythere sub-rufa*, G. S. Brady, 1880, but posterior ridge slightly more prominent). Sculpture of surface very beautiful and approaches that of *C. (C.) tæniata*. Ventral main ridge one-sided and well developed along entire ventral margin. Posterior main ridge, which also is one-sided and well developed, runs slantingly upwards and forwards to about middle of dorsal margin of shell, is somewhat sinuated just dorsally to middle of shell, and joins ventral ridge, with which it forms a well rounded corner. When shell is regarded from the side, dorsal part of posterior main ridge does not cover, or even touch, dorsal margin of shell. Somewhat inside, and about parallel to, anterior margin, there are two narrow and rather low ridges, one somewhat inside of the other; the inner one runs from eye downwards, and they (always ?) join just in front of main ventral ridge. From about middle of posterior main ridge, a somewhat irregular, rather broad, and slightly elevated longitudinal zone runs towards ventral part of inner anterior ridge; this zone marked by a number of more or less scattered small pits. Rest of surface of shell covered with closely-set irregular excavations of moderate size, most of them of moderate depth, some, especially on anterior part of shell, rather shallow. Bottoms of excavations with a varying

number of small pits. Hairs along margin of shell about as in *C. (C.) tæniata*. No dark areas are to be seen, when shell is regarded by transmitted light (of course, with the exception of ridges).

First antenna: Differs from that of *C. (C.) tæniata* in having an irregular longitudinal row of hairs on lateral side of first joint. This character, however, probably not constant.

Remaining organs have the same type as in *C. (C.) tæniata*.

Remarks: This form is structurally very close to *C. (C.) tæniata*. Indeed, the examined females of these two forms differ only in the length and sculpture of the shell; and the differences established are not very pronounced. On the other hand, an examination of the male may prove these two forms to be specifically distinct, since the females of this subgenus frequently are much less differentiated than the males. In other words, the systematic position of this form can not be settled until several specimens of both sexes have been carefully examined. It may be but a modification, or it may be a distinct species. The fact that the two forms have been taken at different localities appears to indicate their systematic independence.

Habitat: **Tierra del Fuego, Puerto Harris**; 11.III.1896: One mature female (S.M.E.).

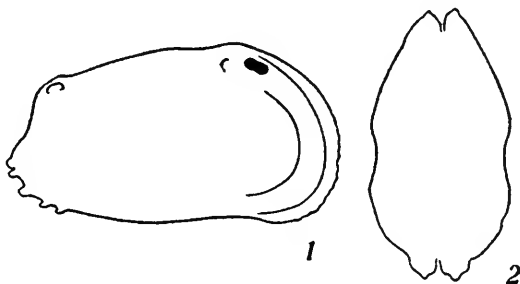
C. (Cythereis) longiductus, new species

Plate I, fig. 8; Plate IV, fig. 6; text fig. XII.

Description: Male—

Shell (Pl. I, fig. 8): Length, 0.86 to 0.89 mm.; length: height, about 1.9:1; length: breadth, about 2:1. Seen from the side: Left valve: Of about same shape as in *C. (C.) megalodiscus*. Ventral part of anterior margin and anterior part of ventral margin furnished with a fine, more or less distinct, crenulation. Hump above eye sometimes even, as in Plate II, fig. 4 of *C. (C.) megalodiscus*, sometimes about as in Plate I, fig. 8. Sinuation just in front of posterior hinge-tooth sometimes scarcely developed. Posterior margin usually slightly sinuated in middle; on, and just antero-ventrally to, beak-like posterior process of valve, there are about five to seven rather strong teeth. Ventral margin sometimes slightly

sinuated in front of middle. Right valve (text fig. XII, 1): Of about same shape as the left; hump above eye, however, somewhat less developed, and dorsal part of posterior margin of valve a little more sinuated. As a rule, ventral margin also slightly more sinuated in front of middle. Seen from below (text fig. XII, 2): Also of about same shape as in *C. (C.) megalodiscus*; usually somewhat sinuated in middle. Sculpture of surface: Seems to be rather constant. Ventral main ridge, which is well developed along entire ventral margin of shell, has narrow edge. Posterior main ridge narrow and of moderate height to rather low; in most cases it joins ventral main ridge, with which it forms a rounded corner somewhat



Text fig. XII. *Cythereis (Cythereis) longiductus*, n. sp., ♂, not type.

1. Right valve from the side. $\times 50$.

2. Shell from below; front end up. $\times 41$. South Georgia, S. A. E., station 25.

inside beak-like postero-ventral process of shell; in all specimens examined it was somewhat sinuated dorsally to middle. Dorsally, this ridge joins two ridges; first, a narrow ridge of moderate height running along and, when shell is seen from the side, in some specimens partly covering, posterior half of dorsal margin of shell; and, second, a similar ridge which runs just inside posterior margin of shell. Somewhat inside, and about parallel to, anterior margin of shell, there is a narrow ridge of moderate height. Surface of shell covered with closely-set, angular excavations of moderate size and depth; ridges between excavations narrow. Some of these ridges are slightly more elevated than the others; one of these more elevated ridges runs from the sinuation of posterior main ridge,

across shell, towards a point somewhat ventrally to middle of anterior margin of shell; just in front of posterior main ridge it often gives off a branch, which runs steeply towards ventral main ridge. From anterior part of postero-dorsal main ridge, a usually bifurcated ridge runs obliquely downwards and forwards. Course of these ridges slightly variable, and in some specimens some of them are not more elevated than the ordinary ones. Bottoms of excavations fairly smooth. Along ventral half of anterior margin and along anterior part of ventral margin of shell, there are about twenty to thirty simple, hyaline, leaf-like bristles; along margin of posterior part of shell, a few simple, narrow bristles occur. No dark fields are to be detected, when shell is regarded by transmitted light.

First antenna: Fourth joint rather much more elongated than in *C. (C.) montereyensis*, being about $\frac{9.5-10.0}{8.5-9.0}$, according to scale used in description of the subgenus. Claws of fourth joint relatively long, being somewhat longer than posterior side of second joint. Pilosity about same as in *C. (C.) montereyensis*; hairs on anterior side of second joint, however, somewhat scarcer.

Second antenna: Positions of bristles about same as in Plate XXXV, fig. 19, G. W. Müller, 1894. The three bristles at about middle of posterior side of second endopodite joint have about same types as in female; the postero-lateral and the medial of these bristles with pectination of moderate strength. It should be noted, however, that of the two last-mentioned bristles, the medial is somewhat longer than the postero-lateral in the male; while in the female (as in males and females of all the other species of this subgenus which I have had the opportunity of examining), the postero-lateral is somewhat longer than the medial. The antero-lateral, sensorial, one of these three bristles has about type shown in text fig. XVI, 3 of *C. (C.) ehippiata*. Postero-distal bristles of this joint and the three claws of distal joint also of about same types and relative lengths as in this figure; postero-lateral end claw, however, slightly weaker and shorter than postero-medial end claw. Pilosity: On lateral side of protopodite there are more or less scattered, short, fine hairs; on medial side of this joint a longitudinal row of fine hairs occurs. Pec-

tinuation of distal plates of second endopodite joint rather fine on medial side of joint and of moderate strength on lateral side.

Mandible: Masticatory joint—Toothed edge of pars incisiva of about same type as in *C. (C.) montereyensis*. No hump on anterior side of dorsal part of this joint. Endopodite: Of the four ventro-distal bristles of first joint found in most species of this subgenus, one of the two shorter is always absent. Hairs of the longitudinal row of hairs on medial side of second joint sometimes about as short as in the mentioned species, sometimes a little longer.

Maxilla: The long one of the four dorso-distal bristles of first joint of palp usually has hairs of moderate length.

Fifth limb: Of about same type as in *C. (C.) montereyensis*, ♂; or exopodite perhaps slightly longer, when compared with protopodite, than in this species. Bristle on posterior side of protopodite slightly longer relatively. Bristle of first exopodite joint about half as long as second exopodite joint, or rather slightly shorter. End claw slightly longer relatively and almost naked.

Sixth limb: Of about same type as in *C. (C.) montereyensis*, ♂, with the same reservations as to relative lengths of exopodite, the bristle on posterior side of protopodite, and end claw, as in the case of fifth limb. Bristle of first exopodite joint slightly shorter than second exopodite joint.

Seventh limb: Of about same type as in *C. (C.) montereyensis*. The following differences to be noted: First exopodite joint somewhat more elongated. The proximal one of the three bristles on anterior side of protopodite about half as long as height of exopodite joints; the middle one of these bristles about as long as anterior side of protopodite. Bristle of first exopodite joint of about same relative length as in the mentioned species, has short hairs, and is almost as weak as corresponding bristle on sixth limb. End claw, just as in fifth and sixth limbs, perhaps slightly longer and weaker relatively and has fairly weak pectination.

Brush-shaped organ: Of about same type as in *C. (C.) montereyensis*.

Penis (Pl. IV, fig. 6): Of about same type as in *C. (C.) tæniata*. The following differences should be noted: Copu-

latory appendage, which has about same type in right and left penes, is slightly longer relatively and more narrowly rounded distally; its postero-ventral process somewhat longer. Free part of ductus ejaculatorius very long, a character from which the species has received its name; at its base it has a lamelli-form, free, rather narrow appendage, kept on inside of copulatory appendage; in accompanying figure its point does not quite reach anterior point of copulatory appendage.

Description: Female—

Shell: Length, about 0.92 mm.; length: height, about 1.8:1; length: breadth, about 1.8:1. Of about same type as male shell, but slightly higher and broader relatively. In female examined, outline of shell, seen from below, was rather slightly sinuated in middle.

Second antenna: Of about same type as in male, with the usual exceptions in exopodite and in relative lengths of the postero-lateral and the medial of the three bristles at about middle of posterior side of second endopodite joint.

Mandible: In the only specimen examined, one of the two short ventro-distal bristles of first endopodite joint was absent, just as in male.

Fifth limb: Of about same type as in male. Bristle on posterior side of protopodite, however, similar to corresponding bristle in *C. (C.) montereyensis*, ♀.

Sixth limb: Of about same type as in male, but bristle on posterior side of protopodite has approximately the type of the corresponding bristle of fifth limb; and bristle of first exopodite joint has same type and relative length as in *C. (C.) montereyensis*, ♀.

Seventh limb: Of about same type as in male. In the single specimen examined, bristle on posterior side of protopodite was somewhat shorter than in male; and bristle of first exopodite joint had about same type as in *C. (C.) montereyensis* and was nearly as long as second exopodite joint.

Genital verruca and posterior part of body about as in *C. (C.) montereyensis*; no spines, however, were detected on back of posterior part of body, and opening on genital verruca had somewhat thicker margins.

Remark: One complete and three incomplete males, and one complete female examined.

Habitat: South Georgia—S.A.E., Station 25, off Grytviken; lat. 54° 22' S., long. 36° 27' W. (type-locality); 21.V.1902; depth, 24-52 m.; grey clay with scattered algæ; four mature males (only one of which was alive when taken), one mature female (alive when taken), and two juvenes. S.A.E. Station 28, mouth of Grytviken, lat. 54° 22' S., long. 36° 28' W.; 24.V.1902; depth, 12-15 m.; sand and algæ: one mature male (dead when taken).

Discophora Group nov.

This group is very uniform and comprises three of the species described in this paper, viz., *C. (C.) discophora*, *mesodiscus*, and *megalodiscus*.

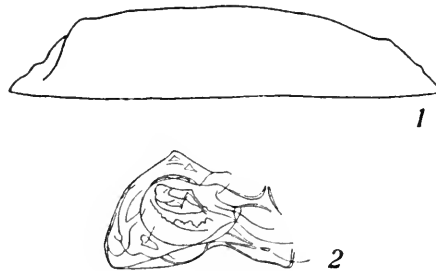
C. (Cythereis) discophora new species

Plate II, fig. 1; text fig. XIII.

Description: Male—

Shell: Length, 0.66 to 0.68 mm.; length: height, about 2.0-2.1:1. Seen from the side of about same shape as in *C. (C.) glauca*. Posterior part of dorsal margin, however, not covered by any ridge, and margin of shell smooth, i.e., without any teeth or crenulation. Ventral margin seems, in most specimens, to be somewhat less sinuated in front of middle than in the mentioned species. Sculpture of surface rather constant; slight variations occur, however, in number, sizes, and positions of excavations, as well as in development of main ridges. Ventral and posterior main ridges, which are one-sided, sometimes have rather broadly rounded edges; most frequently they are united somewhat in front of postero-ventral corner of shell; and from their point of union a low, spur-like, rather narrow ridge issues to edge of the mentioned corner of shell. Anteriorly, ventral ridge is continued by a low and rather narrow ridge, which runs about parallel to and at a rather great distance from anterior margin of shell as far as to eye. No other main ridges are developed. Surface of shell covered with numerous closely-set, rounded or more or less angular excavations of moderate size and depth; surface just outside muscle-spots has, however, but a few, rather small

pits. Excavations arranged rather irregularly. Among bristles along anterior margin and along anterior part of ventral margin of shell, about 25 to 35 are rather short, hyaline, flattened, and leaf-like, and their edges have short and fine hairs. Along posterior part of ventral margin and along posterior margin of shell, there is a moderate number of rather short, simple, narrow bristles. When seen by transmitted light, the shells (of specimens preserved in alcohol) have a light brownish color. No dark fields are to be seen, of course, with the exception of ridges.



Text fig. XIII. *Cythereis (Cythereis) discophora*, n. sp., not type.

1. Left valve from above, ♀. ×84.

2. Copulatory appendage of right penis from the medial side.
×215. Falkland Islands, S. A. E., station 46.

First antenna: Fourth joint somewhat more elongated than in *C. (C.) montereyensis*, being about $\frac{8}{7}$, according to scale used in description of the subgenus. Bristle in front of posterior claw of fourth joint slightly shorter relatively than in the mentioned species. On first joint there is an irregular, longitudinal row of hairs both on medial and on lateral side.

Second antenna: Bristle on first endopodite joint somewhat shorter than in *C. (C.) montereyensis*. Second endopodite joint: Positions of bristles on this joint about as in Pl. XXXV, fig. 19, G. W. Müller, 1894. The posterolateral and the medial ones of the three bristles at about middle of posterior side of this joint about as in *C. (C.) mesodiscus*, and furnished with rather few and moderately strong, spine-like hairs. Pilosity of protopodite about as in *C. (C.) montereyensis*, but an irregular longitudinal row of hairs

occurs on lateral side. Spines of distal plates of second endopodite joint rather weak on medial side and rather strong on lateral side of joint. There seems to be no spines at base of anterior end claw.

Mandible: Masticatory joint: The next to the posterior pair of teeth of pars incisiva somewhat larger relatively than in text fig. VII, 9 of *C. (C.) montereyensis*. The next to the anterior tooth of this edge is paired, and sometimes a few of the paired teeth are more or less bifurcated. No rounded hump on anterior side of dorsal half of this joint. Epipodial appendage: The peg-like appendage has rather long, fine hairs. Endopodite: The strong ventro-distal bristles of first joint usually somewhat weaker than in text fig. VII, 9 of *C. (C.) montereyensis*. The row of hairs on medial side of second endopodite joint made up of rather long hairs; most of these about as long as height of end joint.

Maxilla: Of the four dorso-distal bristles on first joint of palp, the long one is furnished with hairs of moderate length.

Fifth limb: This limb is somewhat more slender than in *C. (C.) montereyensis*; relative lengths of joints about same as in *C. (C.) montereyensis*. Bristle on first exopodite joint somewhat more slender than in this species; remaining bristles about as in male of this species. Pectination of end claw as well as distal pectination of joints rather weak.

Sixth limb: Exopodite slightly longer relatively and somewhat more slender than in *C. (C.) montereyensis*. The middle one of the three bristles on anterior side of protopodite about as long as this side. Other bristles about as in *C. (C.) montereyensis*, ♂; end claw, however, slightly weaker, and with rather weak pectination. Distal pectination of joints also rather weak.

Seventh limb: Relative lengths of the joints:

Protopodite $\frac{11}{14}$ Exopodite I. $\frac{11.5}{12.5}$ II. $\frac{7}{6}$ III. $\frac{7}{6.5}$

Exopodite somewhat more slender than in *C. (C.) montereyensis*. Protopodite: Proximal bristle on anterior side unusually well developed, about as long as half the height of exopodite joints or even slightly more. Other bristles of this joint slightly shorter than in *C. (C.) montereyensis*. Bristle on first exopodite joint has same slender type as in fifth and sixth limbs of male, and is about half as long as second ex-

opodite joint or somewhat longer. End claw slightly weaker than in the mentioned species.

Chitinous support of these three limbs, on the sides of posterior part of body, characterized by the fact that some of the stripes frequently are distinctly broader than in *C. (C.) montereyensis*.

Brush-shaped organ: About intermediate between that of *C. (C.) montereyensis* and that of *C. (C.) platycopa*.

Penis: Of about same type as in *C. (C.) mesodiscus*, but discus-shaped plate somewhat different and smaller (text fig. XIII, 2). Outline of copulatory appendage somewhat variable, sometimes of about type shown in the mentioned figures, sometimes about as in figure of *C. (C.) mesodiscus*. I am not quite sure whether there is any difference between this species and *C. (C.) mesodiscus* in chitinous skeleton just behind copulatory appendage, since this skeleton is not only extraordinarily complicated but also somewhat variable; fundamental type, however, the same in both species.

Description: Female—

Shell (text fig. XIII, 1, and Pl. II. fig. 1): Length, 0.66-0.69 mm.; length: height, about 1.8-1.9:1; length: breadth, about 2.1:1: Seen from the side, of about same shape as in male, but, as will be seen from figures given above, somewhat higher relatively. Ventral margin seems to be somewhat more sinuated in front of middle. Seen from above, shell is widest at about middle, with a somewhat irregular outline, gently tapering towards anterior extremity, and more abruptly posteriorly. Posterior ridge forms a more or less marked projection. In other respects of about same shape as in male.

Second antenna: Exopodite: Somewhat shorter than in most of the remaining species of this subgenus; about 1.5 to 2.0 times longer than anterior side of first endopodite joint and of about same type as in *C. (C.) ehippiata*.

Fifth limb: Of about same type as in *C. (C.) montereyensis*, ♀.

Sixth limb: This differs from that of male mainly in the following respects: Bristle on posterior side of protopodite of about same type as corresponding bristle of female fifth limb. Bristle of first exopodite joint of about same type and

relative length as in *C. (C.) montereyensis*, ♀, but slightly weaker (perhaps also slightly shorter) relatively.

Seventh limb: Differs from that of male chiefly in bristle of first exopodite joint, which is of about same type as in *C. (C.) montereyensis* but slightly weaker.

Genital verruca and hind part of body of about same type as in *C. (C.) montereyensis*; however, no rows of spines were detected on back of posterior part of body.

Remark: Three males and four females were examined.

Habitat: Falkland Islands—S.A.E., Station 46, Port Louis, Carenage Creek, lat. 51° 32' S., long. 58° 7' W. (type-locality); 9.VIII.1902; depth, 1 m.; sand with *Codium*: Four males and seventeen females, all mature.

C. (*Cythereis*) *mesodiscus*, new species

Plate II, figs. 2 and 3; Plate IV, fig. 7; text fig. XIV.

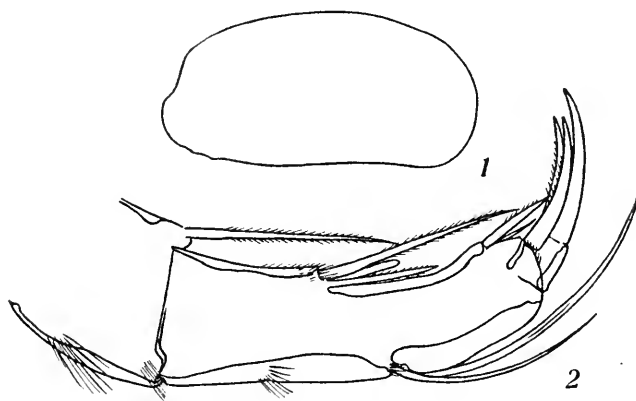
Description: Male—

Shell (Pl. II, figs. 2 and 3; text fig. XIV, 1): Length, about 0.78 mm.; length: height, about 2:1; length: breadth, about 2.35:1. Seen from the side: Left valve: Oblong, greatest height at about anterior hinge-tooth, anterior half distinctly larger than posterior. Anterior margin smooth. Dorsal margin evenly and slightly convex, sometimes almost straight; slopes gently posteriorly, sometimes with a slight depression just behind anterior hinge-tooth. Posterior extremity produced below middle in a nearly rectangular, broadly rounded beak; dorsal part of posterior margin slightly arched to almost straight, and forms with the dorsal margin a broadly rounded but distinct corner. Ventral margin almost straight to rather slightly sinuated in front of middle and joins the posterior without forming any corner. Edge of beak-like postero-ventral process smooth, or almost so; but just antero-ventrally to beak there are two very low and rounded teeth. Right valve: Differs from left mainly in the following respects: Anterior margin somewhat more flattened dorsally (sometimes slightly more than in text fig. XIV, 1) which makes corner above eye somewhat more distinct. Dorsal part of posterior margin distinctly sinuated, not, however, always so much as in text fig. XIV, 1. Dorsal margin, at

least in some specimens, somewhat more arched. Seen from above, shell is somewhat varying in shape; of about shape shown in Pl. XIII, fig. 6f (*Cythere flabellucostata*), G. S. Brady, 1880; flattened at sides; sometimes middle parts of lateral outlines are slightly and somewhat irregularly arched, sometimes almost straight, and sometimes somewhat irregularly sinuated. Sculpture of surface somewhat variable. In the two specimens from Chubut, Puerto Madryn, the type-locality, it was of about the following type (Pl. II, fig. 3): Ventral and posterior main ridges very slightly developed; in one of these specimens the posterior was scarcely distinguishable. From a point somewhat in front of muscle-spots, a low ridge runs slantingly forwards and downwards, and from eye another low ridge runs in about the same direction. Surface covered with numerous, rather shallow, rounded to more or less irregular excavations; most of these rather small, some of moderate size. Bottoms of most of the larger excavations marked by a varying number, about two to five, of small pits. Arrangement of excavations variable; sometimes about as in the mentioned figure, sometimes irregularly scattered. In specimen from Isla Nueva, sculpture differed from type described above chiefly in the following respects (Pl. II, fig. 2): Ventral and posterior main ridges somewhat more developed, especially posterior part of ventral ridge and posterior ridge were well developed; they were one-sided, and their slopes towards margin of shell were very steep. Posterior ridge somewhat irregular, being sinuated dorsally. From point of union of these two ridges, a low, spur-like ridge continued out on beak-like postero-ventral process of shell. Excavations just posterior to middle of shell arranged in rather distinct longitudinal rows; excavations on dorsal half of shell perhaps on an average somewhat larger, and nearly all of them divided into small pits. Along anterior margin and along anterior part of ventral margin of shell, there is a series of about twenty-five to thirty flattened, hyaline, leaf-like hairs. No dark fields to be detected when shell is regarded by transmitted light.

First antenna: Of about same type as in *C. (C.) discophora*.

Second antenna (text fig. XIV, 2): Bristle on first endopodite joint somewhat shorter than in *C. (C.) montereyensis*. Distal half of second endopodite joint slightly broader, and its anterior wall somewhat stronger than in most species of this subgenus. *C. (C.) discophora* and *megalodiscus* agree in this respect with normal type of the subgenus. Positions of bristles of this joint nearly same as in *C. (C.) montereyensis*. Of the three bristles at about middle of posterior side, the postero-lateral is furnished with moderately strong pectina-



Text fig. XIV. *Cythereis (Cythereis) mesodiscus*, n. sp., ♂, not type.

1. Right valve from the side. $\times 55$.

2. Endopodite of right second antenna from the medial side. $\times 355$. Tierra del Fuego, Isla Nueva.

tion; the medial bristle about half as long as the postero-lateral, and of about same type as this but of subequal thickness throughout its entire length. Pilosity of protopodite about as in *C. (C.) discophora*, or the irregular longitudinal row of hairs on lateral side is more or less reduced. Spines on distal plates of second endopodite joint of moderate strength on lateral side and weak on medial side of the joint. There are no spines at base of anterior end claw.

Mandible: Masticatory joint and row of hairs on medial side of second endopodite joint about as in *C. (C.) discophora*. Peg-like appendage of epipodite seems to be naked or almost so. In other respects this appendage agrees with normal type.

Maxilla, fifth, sixth, seventh limbs, chitinous support of the three last-mentioned limbs, and brush-shaped organ, about as in *C. (C.) discophora*, ♂.

Penis (Pl. IV, fig. 7): No spiral thickening was detected in wall of vas deferens. Ductus ejaculatorius has no narrow, tube-like, free distal part but ends with a movable discus-like plate, somewhat larger than in *C. (C.) discophora*. Copulatory appendage well rounded distally and of moderate size.

Female: Unknown—

Remarks: The sculpture of the surface of the shell in the specimen taken at Isla Nueva showed, as is noted above, rather remarkable differences from that of the specimens from Chubut, Puerto Madryn. Do these differences indicate that the species in its present scope is not a natural systematic unit? This question can, of course, not be settled at present. The fact that all my specimens showed perfect agreement in other characters, and the differences in the sculpture exhibited by the two specimens from Chubut, the type-locality, seem, however, to indicate that this question is to be answered in the negative. It is undoubtedly most convenient to consider these three specimens tentatively as members of the same species.

All recorded specimens were closely examined.

Habitat: **Tierra del Fuego**—Chubut, Puerto Madryn (type-locality); 8.XI.1895; depth, about 9 m.; sand: Two mature males (S.M.E.). **Isla Nueva**; 7.II.1896; depth, about 15 m.: One mature male (S.M.E.).

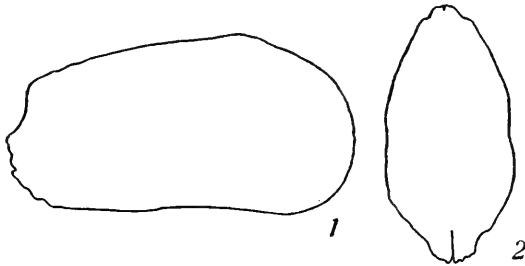
C. (*Cythereis*) *megalodiscus*, new species

Plate II, fig. 4; Plate IV, fig. 8; text fig. XV.

Description: Male—

Shell: Length, about 0.76 to 0.80 mm.; length: height, about 1.9-2.0:1; length: breadth, about 2.0-2.1:1. Seen from the side: Left valve (Pl. II, fig. 4): Of about same shape as in *C. (C.) mesodiscus*. Ventral part of anterior margin and anterior part of ventral margin more or less distinctly crenulated. Posterior margin somewhat steeper than in the mentioned species; along its ventral part and along posterior part of ventral margin, there are about five to nine more or less strong teeth. Dorsal margin somewhat sinuated just behind

eye and just in front of posterior hinge-tooth. Ventral margin almost straight. Right valve (text fig. XV, 1): Differs from the left mainly in the following respects: Dorsal part of anterior margin slightly more flattened; dorsal part of posterior margin distinctly sinuated, not always as much, however, as in text fig. XV, 1. Dorsal margin without or with but slight sinuations anteriorly and posteriorly. Ventral margin in most cases slightly sinuated in front of middle. Seen from above (text fig. XV, 2, ♀): Somewhat irregular and not quite constant in shape; outline usually slightly sinuated in middle, tapering gently in front, and usually somewhat more abruptly behind; extremities somewhat irregular. Sculpture of surface (Pl. II, fig. 4): Seems to be rather constant; details of reticulation, of course, somewhat variable. Ventral main ridge one-sided and in most specimens fairly well developed along greater part of ventral margin. Posterior main



Text fig. XV. *Cythereis (Cythereis) megalodiscus*, n. sp., not type.

1. Right shell from the side, ♂. ×60.

2. Shell from above; anterior end above, ♀. ×41. S. A. E., station 28.

ridge seems, in most cases, not to be developed. Along posterior part of dorsal margin, there is usually a low to moderately high, one-sided ridge. A narrow and rather low ridge runs somewhat inside and nearly parallel to anterior margin. Surface covered with a net-work of low, narrow ridges; meshes of this network of moderate size and usually irregular in shape; bottom of each mesh marked by a number of small, closely-set pits. Along anterior margin and along anterior half of ventral margin of shell, there are about twenty-five to thirty-five somewhat flattened, hyaline bristles; along posterior

part of ventral margin and along posterior margin there is a number of bristles, most of which are narrow. No dark fields to be detected when shell is regarded by transmitted light.

First antenna: Fourth joint somewhat more elongated than in *C. (C.) montereyensis*, being about $\frac{8}{7}$, according to scale used in description of the subgenus. Bristle in front of the proximal claw of this joint sometimes about as long as in the mentioned species, sometimes distinctly shorter, even but half as long as claw. On first joint there is a longitudinal row of hairs both on medial and on distal side; hairs on anterior side of second joint somewhat scarcer than in *C. (C.) montereyensis*; pilosity of the two distal joints is also somewhat less developed than in most species of this subgenus. Finally, it should be noted that claws of fourth joint in most specimens are slightly longer relatively than in most species of this subgenus, being slightly longer than posterior side of second joint.

Second antenna: Exopodite distinctly three-jointed. Endopodite: Second joint: Positions of bristles about same as in Plate XXXV, fig. 19, G. W. Müller, 1894. Of the three bristles at about middle of posterior side of joint, the postero-lateral and the medial are subequal and approximately of same type, rather finely pectinated, their tips reaching to or slightly beyond point of attachment of the strong postero-distal bristle of this joint; the antero-lateral of these three bristles, i.e., the sensorial bristle, has about same type as in text fig. XVI, 3 of *C. (C.) ephippiata*, and is about one-third to one-half shorter than its neighbors. End joint: End claw perhaps slightly longer than in *C. (C.) montereyensis*. Of the two posterior (proximal) claws, the medial one has about same type and relative size as in most of the other species of this subgenus; the lateral distinctly shorter and weaker (about one-third shorter than the medial). Pilosity: On lateral side of propodite there are usually scattered, exceedingly short and fine hairs; on medial side of this joint a longitudinal row of fine hairs occurs. Along postero-distal edge of second endopodite joint, there are very short and fine hairs. Spines of distal plates of this joint apparently weak; however, I have not been able to establish this character with full certainty.

Mandible: Masticatory joint: Toothed edge of pars incisiva has about same type as in *C. (C.) montereyensis*. No hump on dorsal part of this joint. The two short ventrodistal bristles of first endopodite joint usually somewhat shorter than in most of the species of this subgenus. Longitudinal row of hairs on medial side of second endopodite joint generally composed of rather short hairs.

Maxilla: Of about same type as in *C. (C.) discophora*.

Fifth limb: Exopodite slightly longer, when compared with protopodite, than in *C. (C.) montereyensis*; furthermore, it is somewhat more slender than in this species. Bristle on posterior side of protopodite swollen at base and furnished with long, soft hairs. [In *C. (C.) discophora* and *mesodiscus* these hairs are somewhat longer than in most of the species of this subgenus, but stiff. Moreover, this bristle is not swollen at the base in these two species.] Bristle of first exopodite joint somewhat weaker and end claw perhaps slightly weaker and longer than in *C. (C.) montereyensis*; end claw nearly naked.

Sixth limb: Exopodite somewhat longer, when compared with protopodite, than in *C. (C.) montereyensis*; differences, however, not great, as will be seen from the following figures:

$$\text{Protopodite } \frac{10}{13} \quad \text{Exopodite I. } \frac{7}{9.5} \quad \text{II. } \frac{7.5}{6} \quad \text{III. } \frac{7}{6.5}$$

It is also slightly more slender than in this species. End claw, which is nearly naked, also slightly longer relatively and somewhat more slender than in text fig. VIII, 15 of *C. (C.) montereyensis*. In other respects this limb agrees with that of male of the mentioned species.

Seventh limb: Of about same type as sixth limb. Relative lengths of joints:

$$\text{Protopodite } \frac{11}{14.5} \quad \text{Exopodite I. } \frac{10.5-11.0}{13} \quad \text{II. } \frac{8}{6.5} \quad \text{III. } \frac{8}{8}$$

The proximal of the three bristles on anterior side of protopodite about as well developed as in *C. (C.) discophora*. Other bristles of this joint sometimes slightly shorter relatively than in *C. (C.) montereyensis*. Exopodite: Bristle of first joint about as long as second joint and almost as thin as corresponding bristle of sixth limb of male; contrary to the last-mentioned bristle, it is, however, in most cases furnished with a coat of dense, short, and fine hairs. End claw has

about same type and relative length as in sixth limb, its pectination, however, somewhat better developed.

Some of the dorsal strips of chitinous support of these limbs, on the sides of body, appear to be absent in most specimens.

Brush-shaped organ: Of about same type as in *C. (C.) montereyensis*.

Penis (Pl. IV, fig. 8): Of about same type as in *C. (C.) mesodiscus*; differences between penes of *C. (C.) mesodiscus* and *megalodiscus*, however, greater than between penes of *C. (C.) discophora* and *mesodiscus* (compare accompanying figures). Especially noteworthy is difference in size of discus-shaped plate of ductus ejaculatorius; this plate distinctly larger in *C. (C.) megalodiscus* than in *C. (C.) mesodiscus*, a character for which the species has been named. No spiral thickening could be detected in wall of vas deferens. Ductus ejaculatorius has no free distal part.

Description: Female—

Shell: Length, about 0.79-0.88 mm.; length: height, about 1.7-1.8:1; length: breadth, about 1.83-1.93:1. Of about same shape and structure as in male, but distinctly higher and broader relatively, as will be seen from figures given above.

Second antenna: Differs from that of male mainly in the following respects: Exopodite as in *C. (C.) montereyensis*, ♀. Of the three bristles at about middle of posterior side of second endopodite joint, the postero-lateral and the medial are, on an average, slightly longer relatively. The two posterior, proximal, claws of end joint are of about normal size and strength; or the lateral is but slightly weaker and shorter. Spines on distal plates of second endopodite joint weak.

Fifth limb: Almost perfectly of same type as in *C. (C.) montereyensis*, ♀, perhaps slightly longer and weaker. End claw almost naked and slightly longer and weaker relatively than in the mentioned species.

Sixth limb: Either of about same type as in *C. (C.) montereyensis*, or exopodite slightly longer, when compared with protopodite, and slightly more slender. Bristle on posterior side of protopodite has about same type as that of fifth limb. End claw resembles that of male; frequently it is somewhat less curved than in *C. (C.) montereyensis*; this seems also to

be true of end claws of fifth and seventh limbs, both in males and females. Bristle on first exopodite joint about half as long as second joint or slightly longer or shorter; in some cases this bristle is slightly weaker than in the mentioned species. Other bristles of this limb about as in *C. (C.) montereyensis*, ♀.

Seventh limb: Of about same type as in male.

Genital verruca and hind part of body about as in *C. (C.) montereyensis*. Bristle on posterior extremity of body, however, situated on a verruciform projection of about same shape as in plate 18, figure 11 (*Paracytheroma pedrensis*), Ch. Juday, 1907. No spines were detected in the neighborhood of this bristle.

Remark: Four mature males and three mature females were examined.

Habitat: **South Georgia**—S.A.E., Station 25, off **Grytviken**, lat. 54° 22' S., long. 36° 27' W.; 21.V.1902; depth, 24 to 52 m.; grey clay with scattered algæ: Two mature males, seven mature females, and four juvenes. S.A.E., Station 28, off **Grytviken**, lat. 54° 22' N., long. 36° 28' W. (type-locality); 24.V.1902; depth, 12 to 15 m.; sand and algæ: Eighteen specimens, mature males and females, and juvenes. S.A.E. (no number of the station), **Grytviken**; 24.V.1902; depth, 1 to 2m.: One mature male, dead when taken.

Frequens Group nov.

Only one of the species described in this paper, viz., *C. (C.) frequens*, belongs to this group. Among the other species of this genus, *C. (C.) devesa* G. W. Müller, 1908, is to be assigned to this group. Another probable member is *C. wyville-thomsoni* (G. S. Brady, 1880).

C. (Cythereis) frequens new species

Plate II, fig. 5; Plate V, fig. 1.

Description: Male—

Shell: Length, 0.95 to 1.02 mm.; length: height, about 1.9 to 2:05:1; length: breadth, about 2.1 to 2.2:1. Seen from the side: Left valve: Of about same shape as in *C. (C.) megal-*

discus. Following features are noteworthy: Anterior margin fringed with a regular series of small teeth. Sinuation of dorsal margin just in front of posterior hinge-tooth very slight, sometimes not even distinguishable. Dorsal part of posterior margin nearly straight to very slightly sinuated. Ventral margin slightly sinuated in front of middle and slightly convex behind middle. Along posterior part of ventral margin and along ventral part of posterior margin, there are six to nine rather strong teeth. Right valve: Differs from the left mainly in the following respects: Hump just above eye very slightly, or not at all, developed; dorsal part of posterior margin somewhat more sinuated. Seen from below: Somewhat irregular in shape. Side contours usually somewhat sinuated at about middle; converge gently towards the rather narrow, irregularly truncated anterior extremity; sub-parallel just behind middle; and converge abruptly towards the irregularly truncated posterior extremity. (See *C. devexa*, G. W. Müller, 1908, Pl. XVII, fig. 8.) Sculpture of surface (Pl II, fig. 5; ♂ = ♀): Seems to be very constant; details of reticulation, of course, somewhat variable. Ventral ridge, which has a narrow edge, well developed along entire ventral margin. Along anterior part of posterior half of dorsal margin of shell, there is a more or less well developed, one-sided ridge, which does not cover dorsal margin, when shell is regarded from the side. Posterior main ridge very short and of about same type as postero-dorsal ridge with which it forms a sub-rectangular, fairly sharp to somewhat rounded corner. Just inside, and subparallel to, posterior margin, there is a rather low and narrow ridge. Along anterior margin of shell, often covering it when shell is regarded from the side, there is a narrow, more or less well developed, usually rather low ridge. Surface of shell characterized by closely-set angular excavations of moderate size and depth; those just outside muscle-spots somewhat smaller than the others. Ridges separating these excavations of subuniform height and breadth, narrow. Sometimes excavations are rather shallow; their bottoms fairly smooth. Along anterior margin and along anterior part of ventral margin of shell, about twenty-five to thirty-five narrow to but slightly flattened, simple bristles of moderate length occur; along posterior half of ventral margin of shell such bristles are

also found. No dark fields to be detected, when shell is regarded by transmitted light.

First antenna: Relatively elongated. Relative lengths of joints about as follows:

$$\text{I. } \frac{14}{16} \quad \text{II. } \frac{13}{10} \quad \text{III. } \frac{4}{5} \quad \text{IV. } \frac{11}{10} \quad \text{V. } \frac{4}{5}$$

Bristle on second joint distinctly longer than posterior side of this joint; its point reaches to about distal boundary of fourth joint. Relative lengths of bristles about same as in text fig. VI, 5 of *C. (C.) montereyensis*. Claws of fourth joint distinctly longer than posterior side of second joint. Length of bristle just in front of proximal claw of fourth joint rather variable, sometimes only about one-half as long as claw. Pilosity: On first joint there is a longitudinal row of hairs on both medial and on lateral sides. Hairs on anterior side of second joint somewhat less numerous than in *C. (C.) montereyensis*. Hairs on fourth joint perhaps somewhat weaker than usual.

Second antenna: Of about same type as in *C. (C.) longiductus*, ♂. Bristle of first endopodite joint almost as long as posterior side of second endopodite joint. The sensorial, antero-lateral, of the three bristles at about middle of posterior side of second endopodite joint about as in *C. (C.) montereyensis*, ♀. Spines of distal plates of second endopodite joint have about same strength on both sides of joint, rather weak to moderately strong.

Mandible: Masticatory joint: The next to the anterior tooth of pars incisiva paired; the next to the posterior pair of teeth distinctly larger than in *C. (C.) montereyensis*, and posterior pair of teeth not so deeply bifurcated as in this species. Dorsal half of this joint has no, or only a very small, hump on its anterior side. Palp slightly more slender, and its distal joint slightly longer than in most species of this subgenus. Of the eight dorso-distal bristles of second endopodite joint, the long, annulated one (i.e., the one situated just ventrally to verruciform process on which the seven others are situated) is relatively weak, of about same strength as the five long ones, and only rather slightly longer than end joint. Due to elongation of end joint, the long bristles of this joint are not quite twice as long as joint. Hairs in the row of hairs on medial side of second endopodite joint sometimes as short as in *C. (C.) montereyensis*, sometimes slightly longer.

Maxilla: Among the dorso-distal bristles of first joint of palp, the long one and one of the short sometimes are furnished with hairs of moderate length, sometimes they have short hairs.

Fifth limb: Exopodite somewhat longer, when compared with protopodite, and somewhat more slender than in *C. (C.) montereyensis*. Bristles of protopodite have about same types as in male of this species but are, as a rule, slightly longer relatively. Bristle on first exopodite joint has about same type as in *C. (C.) montereyensis*. End claw slightly longer than in this species and almost naked.

Sixth limb: Exopodite somewhat longer, when compared with protopodite, and somewhat more slender than in *C. (C.) montereyensis*; first exopodite joint somewhat longer than second exopodite joint. Bristles of protopodite about as in *C. (C.) montereyensis*. Bristle on first exopodite joint, which is about as strong as in *C. (C.) montereyensis*, ♀, or but slightly weaker, is about half as long as second exopodite joint, or slightly longer. End claw somewhat longer and weaker than in the mentioned species and of about same type and size as that of fifth limb.

Seventh limb: Just as in the two preceding limbs, exopodite is somewhat longer, when compared with protopodite, and somewhat more slender than in *C. (C.) montereyensis*; first exopodite joint is somewhat, in most cases rather considerably, longer than second exopodite joint. Among the three bristles on anterior side of protopodite, the proximal is somewhat better developed than in *C. (C.) montereyensis*, but still it is nearly vestigial; the two remaining ones are about as in this species. Bristle on first exopodite joint usually slightly weaker than in *C. (C.) montereyensis*, and in most specimens about as long as second exopodite joint. End claw is similar to that of sixth limb but slightly longer and furnished with rather weak pectination.

Chitinous support of these three limbs, on sides of body, has about same type as in most of the species of this subgenus but usually somewhat simpler, one to a few bars being absent or more or less weak and irregular.

Brush-shaped organ: About intermediate in shape and structure between that of *C. (C.) montereyensis* and that of *C. (C.) platycopa*.

Penis (Pl. V, fig. 1): Recalls strikingly this organ in *Cythereis devexa*, G. W. Müller, 1908, p. 137, fig. 1; as to differences, compare figures. Vas deferens has distally a spiral thickening. Ductus ejaculatorius ends in a large, peculiar, and very complicated appendage which is nearly as large as copulatory appendage (when regarded from within even somewhat more complicated than in accompanying figure). Right and left penes of about same type.

Furca: Seems to have only two bristles; the short and narrow bristle of the other species appears to be absent.

Description: Female—

Shell (Pl. II, fig. 5): Length, 0.95 to 1.03 mm.; length: height, about 1.8 to 1.9:1; length: breadth, about 1.9 to 2.0:1. Seen from the side as well as from below, of about same shape as in male but somewhat higher and wider relatively. Also in other features shells agree in the two sexes.

Second antenna: Of about same type as in *C. (C.) longiductus*, ♀.

Fifth limb: Of about same type as in male, but bristle on posterior side of protopodite similar to corresponding bristle in *C. (C.) montereyensis*, ♀.

Sixth limb: Of about same type as in male. Bristle on the posterior side of protopodite, however, of same type and size as corresponding bristle of fifth limb.

Seventh limb: Of about same type as in male.

Genital verruca and posterior part of body about as in *C. (C.) montereyensis*. End bristle of body situated on a verruciform process. No spines were detected on back of posterior part of body.

Remarks: This species appears to be structurally rather close to *Cythereis devexa*, described by G. W. Müller, 1908, p. 137, from the Antarctic, the "Gauss-station". Differences between the two species are to be found both in the shape and sculpture of the shell and in the structure of the penis. (The other organs are unknown in *C. devexa*.) The differences are, however, apparently fairly small.

It is probably also fairly closely related to *C. wyville-thomsoni*, G. S. Brady, 1880, Pl. XX, fig. 4. Only the shell is known of this species.

Among the specimens examined by me, some had the same size of shell and the same structure of appendages as the mature ones but their external genitalia were very slightly developed.

Four mature males and five mature females were examined.

Habitat: South Georgia—S.A.E., Station 25, off Grytviken, lat. 54° 22' S., long. 36° 27' W.; 21.V.1902; depth, 24 to 52 m.; grey clay with scattered algæ: 111 specimens: 21 mature males; 34 juvenes (smaller than the mature specimens); the rest were either mature females or specimens of the type noted in the section of "remarks".

Ehippiata Group nov.

This group comprises, among the species described in this paper, *C. (C.) ehippiata*, *théli*, and *recurvirostra*.

C. (Cythereis) ehippiata, new species

Plate II, fig. 7; Plate III, fig. 3; Plate V, fig. 2; text fig. XVI.

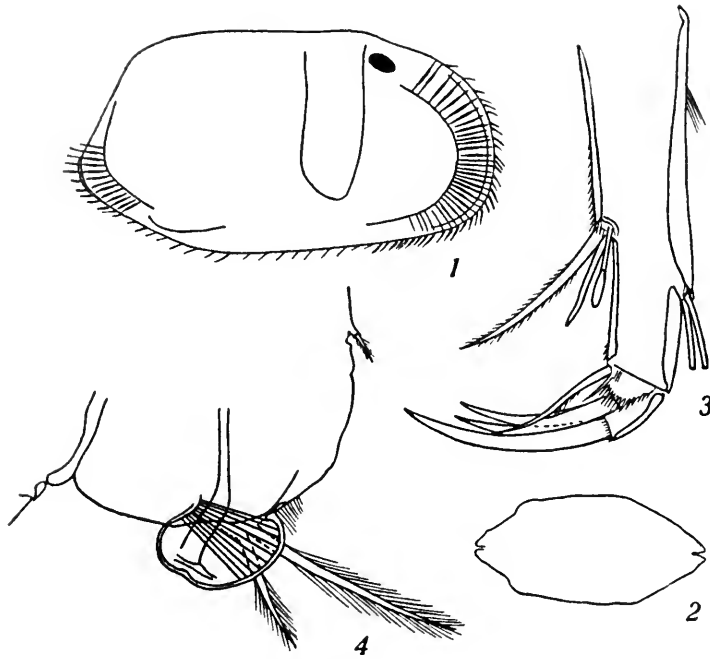
Cythereis sp. . . . T. Skogsberg, 1920, p. 145.

Description: Male—

Shell: Length, about 0.77 to 0.81 mm.; length: height, about 1.85 to 1.90:1. Seen from the side: Left valve: Rather elongated, highest somewhat behind middle, dorsal and ventral margins sub-parallel to each other. Dorsal margin slightly convex to nearly straight. Anterior and posterior parts of ventral margin almost straight, or the anterior is slightly sinuated; they form together a broadly rounded, more or less distinct corner somewhat behind middle of valve. Anterior margin lacks distinct crenulation. Posterior extremity of valve produced somewhat below middle in a distinct, sub-rectangular, rounded, beak-like projection; margin of this beak has no distinct serrulation or spines; dorsal part of posterior margin of valve straight, or almost so, and forms with dorsal margin a broadly rounded corner; ventral part of posterior margin passes into ventral margin without forming any

distinct corner. Right valve (text fig. XVI, 1) almost perfectly of same shape as left one. Seen from below (text fig. XVI, 2), shell is about twice as long as wide, with subparallel sides in middle, its anterior extremity sub-acuminate, its posterior sub-mucronate. Sculpture of surface: Surface covered with closely-set, angular excavations of moderate size and depth (in a few specimens rather shallow), and of somewhat varying shapes; in posterior part of shell, excavations are arranged in more or less distinct rows, sub-parallel to longitudinal axis of shell (Pl. II, fig. 7; ♂ = ♀). Bottom of each excavation has about two to six small pits, bordered by ridges somewhat narrower and lower than those surrounding the large excavations (Pl. III, fig. 3). At muscle-spots surface sometimes is slightly elevated and nearly smooth. Of the main ridges, only the ventral is developed; this is represented, along greater part of ventral margin of shell, by a low ridge (in a few specimens somewhat higher than in the figure of female shell), and ends near posterior end of shell in a short, but usually rather prominent, wing-like, and rounded projection. Pores of surface often rather difficult to detect. Among bristles along anterior margin and along anterior part of ventral margin of shell, about thirty to forty are of moderate length, simple, and slightly widened and flattened; at least some of these bristles have very short, fine marginal hairs. Remaining bristles along margin of shell rather short, simple, and narrow. When seen by transmitted light, shells of specimens preserved in alcohol have a brownish color. Just behind eye, there is a rather broad, dark, saddle-shaped band (about as in text fig. XVI, 1), a character which makes the species very easy to recognize and from which it has been named. By reflected light shell has a slight pink tint, and saddle is milky white, when body is within shell (preserved specimens). When dried and seen by reflected light, shell is milky white, without any visible saddle. Saddle evidently caused by heavy incrustation of lime.

First antenna: Fourth joint somewhat more elongated than in *C. (C.) montereyensis*, being about $\frac{9}{8}$, according to scale used in description of subgenus. The long claws are in some cases somewhat, though very slightly, longer relatively; and the two distal ones of them are somewhat weaker distally than in text fig. VI, 5 of the mentioned species. On lateral



Text fig. XVI. *Cythereis (Cythereis) ephippiata*, n. sp., not type.

1. Right valve from the side, ♂. ×70.
2. Shell from below; anterior end to the right, ♀. ×31.
3. Second and third endopodite joints of right second antenna, seen from lateral side, ♂. ×355.
4. Posterior part of female body seen from the left. ×355.
S. A. E., station 46.

side of first joint, there are a number of scattered, short hairs. On medial side a rather short, irregular row of short hairs (almost scattered) occurs. Long hairs and pectination on anterior side of second joint are somewhat reduced.

Second antenna (text fig. XVI, 3): Slightly more slender than usual. Exopodite: Somewhat more elongated than usual and rather distinctly three-jointed. Endopodite: Bristle of first joint somewhat shorter than in *C. (C.) montereyensis*. Second joint: Positions of bristles about same as in Pl. XXXV, fig. 19, G. W. Müller, 1894. Of the three bristles at about middle of posterior side, the postero-lateral is furnished with a moderately strong pectination; the antero-lateral characterized by unusually distinct shaft and head; the

medial rather narrow, of subequal width throughout its entire length, naked or almost so, and about half as long as the postero-lateral bristle of this group. The strong postero-distal bristle of this joint relatively weak and almost naked. Distal joint: Claws relatively long, end claw being about four to five times longer than anterior side of joint. Pilosity: On medial side of protopodite, there is a relatively long longitudinal row of fine and rather short hairs, as well as a number of scattered hairs; on lateral side of this joint, there are rather numerous more or less scattered hairs of moderate length and some hairs arranged in an irregular, longitudinal row. Spines on distal plates of second endopodite joint, perhaps, somewhat stronger than in *C. (C.) montereyensis*.

Mandible: Masticatory joint: The next to the anterior tooth of pars incisiva, which is single in text fig. VII, 9 of *C. (C.) montereyensis*, is paired. The next to the posterior pair of teeth somewhat larger relatively than in the mentioned species. There is a rounded hump on anterior side of dorsal half of this joint. Second endopodite joint: The long, annulated dorso-distal bristle, i.e., the bristle which is not attached to verruciform process, somewhat weaker and shorter relatively than in text fig. VII, 9 of *C. (C.) montereyensis*, being about, or not quite, twice as long as end joint. Sometimes the annulated, dorsal, bristle of distal joint is also a little shorter relatively than in *C. (C.) montereyensis*. Row of hairs on medial side of second endopodite joint usually consists of hairs somewhat longer than in figure mentioned above.

Maxilla: The long one of the four dorso-distal bristles of first joint of palp has hairs of moderate length.

Fifth limb: Exopodite slightly longer, when compared with protopodite, than in *C. (C.) montereyensis*; first exopodite joint slightly longer than second and third exopodite joints, which are subequal. Bristle on posterior side of protopodite about as long as, or somewhat longer than, distal joint and of about same type as in *C. (C.) montereyensis*, ♂; its hairs are, however, somewhat longer. Bristle on first exopodite joint somewhat weaker than in the mentioned species. End claw, which is almost naked, somewhat longer relatively, and perhaps slightly weaker than, in *C. (C.) montereyensis*.

Sixth limb: Joints of about same relative lengths, and with about same relative lengths and types of bristles as in *C. (C.) glauca*, ♂. Posterior bristle of protopodite has hairs somewhat longer than in most species of this subgenus. End claw somewhat longer than in *C. (C.) montereyensis*, with very fine pectination. On outside of protopodite, somewhat distally to posterior bristle, there is a group of fairly long hairs.

Seventh limb: Of about same shape as in *C. (C.) montereyensis*; exopodite, however, somewhat more elongated than in this species. Bristles of protopodite, too, approximately as in this species; the two distal of the three bristles on anterior side of this joint, however, usually slightly shorter relatively. Bristle on first exopodite joint narrow (it resembles corresponding bristle of sixth limb in male) and about as long as second exopodite joint, or somewhat shorter. End claw somewhat longer than in *C. (C.) montereyensis*. On outside of protopodite, somewhat distally to posterior bristle, there is a group of fairly long hairs.

Chitinous support of these three limbs, on sides of posterior part of body, usually somewhat stronger and of a somewhat simpler type than in *C. (C.) montereyensis*.

Brush-shaped organ: About intermediate between that of *C. (C.) montereyensis* and that of *C. (C.) platycopa*.

Penis (Pl. V, fig. 2): Right and left organs of same type. No spiral thickening detected in walls of vas deferens. Free tube of ductus ejaculatorius of moderate length; its point, which does not extend to point of copulatory appendage, furnished with a rather characteristic spine. Copulatory appendage rather short and pointed.

Description: Female—

Shell (Pl. II, fig. 7 and text fig. XVI, 2): Length, about 0.76 to 0.80 mm.; length: height, about 1.75 to 1.80:1. Of about same type as in male but somewhat higher relatively; usually posterior part somewhat lower, when compared with anterior part, than in males.

Second antenna: Exopodite: Relatively short, being only about one and one-half times longer than anterior side of first endopodite joint, or slightly longer; its proximal joint, which is not much wider than distal joint, not widened distally; proximal joint shows slight signs of articulation at about

middle. Endopodite: Of the three bristles at about middle of posterior side of second joint, the postero-lateral and the medial are furnished with moderately strong pectination. Just as in male, claws of distal joint are almost naked.

Fifth limb: Bristle on posterior side of protopodite swollen at base and has long hairs proximally and short hairs distally. Bristle on first exopodite joint, which is about half as long as second exopodite joint, or slightly longer, has about same strength as in *C. (C.) montereyensis*.

Sixth limb: Differs from that of male mainly in the following respects: Bristle on posterior side of protopodite has about same type as corresponding bristle of fifth limb in female. Bristle on first exopodite joint of about same type and relative length as in *C. (C.) montereyensis*, ♀.

Seventh limb: Of about same type as in male; bristle of first exopodite joint, however, of about same type and relative length as in *C. (C.) montereyensis*.

As to genital verruca, furca, and posterior part of body, see text fig. XVI, 4. I have not been able to detect any rows of spines on posterior part of body. The verruca on which terminal bristle of body is situated is less developed than in most species of this genus.

Remarks: This species is identical with the form discussed on page 145 of my work of 1920 under the name of *Cythereis* sp. At this place the length of the male shell is erroneously stated to be 0.80 to 0.83 mm., instead of 0.77 to 0.81 mm. The lengths of the larval stages are, however, correct. This makes, of course, the agreement with Brooks's law still more striking.

The outlines of the larval shells show the peculiarities noted by G. W. Müller, 1894, p. 181. The surface of the shell in the two youngest stages is covered with closely-set, small, rounded pits, which are not arranged in distinct groups or "excavations," according to the terminology used in the description given above. In the first larval stage, the sculpture exhibits a type transitional between that of the second larval stage and that of the mature specimen; some of the walls between the pits are somewhat higher than others. (Is this an illustration of the phylogenetic development of the sculpture? Cf. G. W. Müller, 1894, p. 88.) The saddle-

shaped structure is to be found in the first, and usually also in the second, larval stage; not, however, in the third larval stage.

Two males and two females, as well as the shells of the remaining specimens, were examined.

Habitat: **Falkland Islands**—S.A.E., Station 41, **Berkeley Straits, Port Louis**, lat. 51° 33' S., long. 58° 9' W.; 23.VII.1902; depth, 2 to 4 m.; clay and sand: One female. S.A.E., Station 46, **Carenage Creek, Port Louis**, lat. 51° 32' S., long. 58° 7' W.; 9.VIII.1902; depth, 1 m.; sand with great quantities of *Codium*: Fourteen mature specimens, males and females, and some larvæ (two specimens and one valve of the first larval stage, four specimens and three valves of the second larval stage, and five specimens and two valves of the third larval stage).

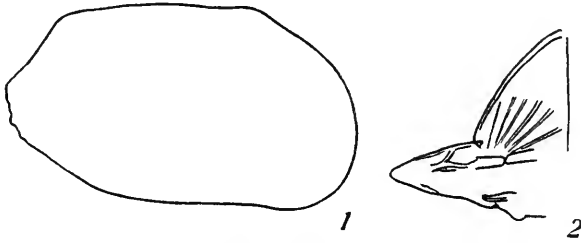
C. (*Cythereis*) *théeli*, new species

Plate II, fig. 6; Plate V, fig. 3; text fig. XVII.

Description: Male—

Shell (Pl. II, fig. 6): Length, about 0.77 to 0.78 mm.; length: height, about 1.7:1; length: breadth, about 1.95:1. Seen from the side: Left valve: Of about same shape as in *C. (C.) ehippiata*, ♀, but dorsal margin slopes somewhat more posteriorly, and posterior corner of valve situated somewhat more dorsally and is somewhat more broadly rounded. Dorsal part of posterior margin of valve gently convex. Ventral part of anterior margin and anterior part of ventral margin of valve very finely crenulated; and on posterior process of valve there are four rather strong teeth. Right valve (text fig. XVII, 1) resembles corresponding valve in *C. (C.) ehippiata*, ♀; dorsal margin slopes, however, somewhat more posteriorly; serrulation and teeth as in left valve. Seen from above, the shell has about same shape as in *C. (C.) montereyensis*. Sculpture of surface appears to be quite constant. Main ventral ridge one-sided and well developed along entire ventral margin of shell. Just inside and about parallel to anterior margin of shell, there is a low, narrow ridge. A similar ridge extends from eye along anterior part of dorsal margin of shell. From about middle of anterior margin of shell, a rather low, narrow, and smooth ridge runs to the anterior

of muscle-spots. Surface of shell is covered with angular to more or less rounded excavations of moderate depth; generally speaking, excavations near the margin of shell are rather small, the others are of moderate size. Excavations along edge of ventral main ridge rather small and arranged in



Text fig. XVII. *Cythereis (Cythereis) thaeli*, n. sp., ♂, not type.

1. Right valve from the side. $\times 61$.

2. Part of left penis, seen from lateral side. $\times 73$. Tierra del Fuego, Chubut.

a distinct row; most of the others scattered fairly irregularly, some of those on posterior half of shell, however, arranged in groups, forming more or less distinct longitudinal rows. In some specimens the ribs between these longitudinal rows are somewhat more prominent than in Pl. II, fig. 6. Hairs along margin of shell resemble those of *C. (C.) ephippiata*. No dark fields to be detected when shell is regarded by transmitted light (of course, with the exception of ridges).

First antenna: Of about same type as in *C. (C.) ephippiata*; the short, latero-distal spine of fourth joint somewhat smaller than usual.

Second antenna: Of about same type as in *C. (C.) ephippiata*. Shaft of the lateral, sensorial, one of the three bristles at about middle of posterior side of second endopodite joint somewhat shorter, when compared with distal part, than in text fig. XVI, 3 of this species. [This character, however, somewhat variable in *C. (C.) ephippiata*.] Bristle of first endopodite joint somewhat weaker than in most species of this subgenus, and its tip reaches but a short distance beyond point of attachment of the three bristles noted above.

Mandible: Resembles that of *C. (C.) ephippiata*; the two short ones of the four ventro-distal bristles of first endopodite joint somewhat shorter than in *C. (C.) montereyensis*.

Maxilla, fifth and sixth limbs about as in *C. (C.) ephippiata*.

Seventh limb: Differs from that of the mentioned species in having end claw somewhat shorter, about as long as in *C. (C.) montereyensis*.

Chitinous support of these limbs, on sides of body, and brush-shaped organ as in *C. (C.) ephippiata*.

Penis (Pl. V, fig. 3 and text fig. XVII, 2): Of about same type as in the mentioned species. The most important difference to be found in copulatory appendage; this is somewhat longer and lower in the present species; appendage of right penis somewhat more pointed than that of left.

Remarks: This species is structurally very close to, perhaps not even specifically different from, *Cythere impluta*, G. S. Brady, 1880, Pl. XXVI, fig. 6. On the other hand, it is certainly not identical with *C. impluta*, G. S. Brady, 1880, Pl. XVI, fig. 3. Even G. S. Brady hesitated to unite these two forms. He wrote as follows on page 77 of the mentioned paper: "The somewhat different forms figured in Plates XVI and XXVI, I at first supposed to belong to distinct species, but my impression now is that they cannot properly be separated." If, however, G. S. Brady's (1880) figures are to be trusted at all, then these two forms cannot possibly belong to the same species. The name of *impluta* should be kept for the form represented by Pl. XVI, fig. 3.

Habitat: **Tierra del Fuego, Chubut** (type-locality); 8.XI. 1895; depth, 9 m.; sand: Two mature males and one detached valve (S.M.E.).

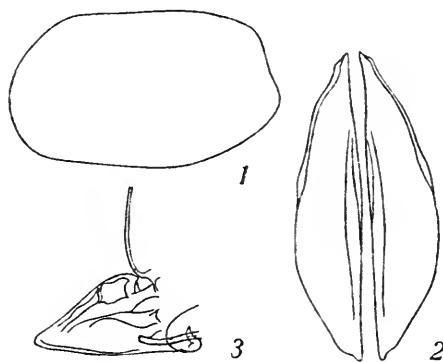
***C. (Cythereis) recurvirostra*, new species**

Plate IV, fig. 1; Plate V, fig. 4; text fig. XVIII.

Description: Male—

Shell (Pl. IV, fig. 1 and text fig. XVIII, 1): Length, about 0.95 mm.; length: height, about 1.8:1; length: breadth, about 2.1:1. Seen from the side: Left valve has about same shape as in *C. (C.) ephippiata*, ♀, but its edge lacks crenulation and

teeth. Right valve: Also of about same shape as in the mentioned species, but postero-dorsal corner somewhat more distinct and ventral margin slightly sinuated in front of middle. Seen from below (text fig. XVIII, 2), shell has about same shape as in *C. (C.) thééli*. Sculpture of surface has about type described for *C. (C.) thééli*. The following features should be noted: There is a postero-dorsal ridge, just as in *C. (C.) frequens*. In specimen examined there was no row of excavations along ventral main ridge, and the small excavations, near



Text fig. XVIII. *Cythereis (Cythereis) recurvirostra*, n. sp., ♂, type.

1. Left valve from the side. $\times 38$.
2. Shell from below; anterior end above. $\times 43$.
3. Copulatory appendage of left penis from the lateral side. $\times 105$. S. A. E., station 59.

margin of shell, were somewhat less distinct. Marginal bristles as in *C. (C.) ephippiata*. No dark fields to be detected when shell is regarded by transmitted light (of course, with the exception of ridges).

First antenna: Of about same type as in *C. (C.) ephippiata*. On medial side of first joint, no longitudinal row of hairs seems to be present. On lateral side of this joint there is a very irregular longitudinal row of short hairs; hairs may, perhaps, better be described as scattered.

Second antenna: Of about same type as in *C. (C.) ephippiata*. Bristle of first endopodite joint is about as long as in *C. (C.) montereyensis*. Of the three bristles at about middle of posterior side of second endopodite joint, the antero-lateral,

sensorial one is about as in *C. (C.) thélii*. Of the two proximal, posterior, end claws of distal joint, the lateral is about as long as the medial, but somewhat weaker.

Mandible, maxilla, fifth, sixth, and seventh limbs, chitinous support of the last three appendages, on sides of body, and brush-shaped organ, all resemble the corresponding organs in *C. (C.) ephippiata*.

Penis also about same as in *C. (C.) ephippiata*. As to differences between these two species in the shapes of copulatory appendages, compare Pl. V, fig. 4 and text fig. XVIII, 3 on the one hand with figures of this organ in the noted species on the other.

Habitat: S.A.E., Station 59, on the **Burdwood Bank**, lat. 53° 45' S., long. 61° 10' W.; 12.IX.1902; depth, 137 to 150 m.; mussel sand with stones: One mature male.

Glauca Group nov.

Out of the species described in the present paper, *C. (C.) glauca*, *platycopa*, and *aurita* presumably belong to this group. The assignments of these species to one group, however, is somewhat uncertain.

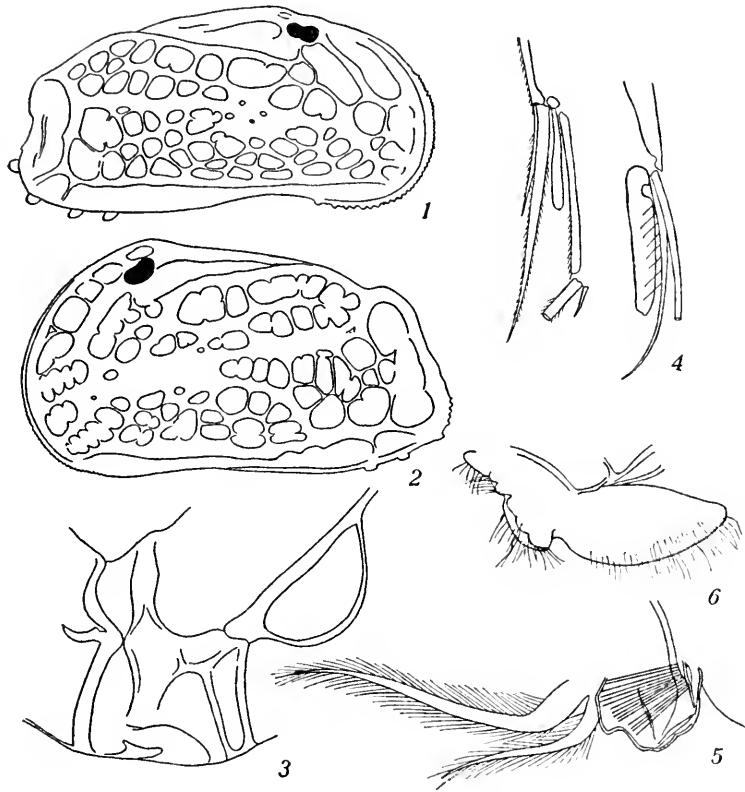
C. (Cythereis) glauca, new species

Plate III, figs. 2, 6 and 7; Plate VI, fig. 4; text fig. XIX.

Description: Male—

Shell: Length, 0.74 to 0.76 mm.; length: height, about 2:1; length: breadth, about 2.25:1. Seen from the side: Left valve: Oblong, highest in front of middle, at about anterior hinge-tooth, and with anterior half distinctly larger than posterior. Lower half of anterior margin and anterior part of ventral margin finely crenulated. Dorsal margin evenly and moderately convex, slopes gently posteriorly, and has a slight depression just behind greatest height of valve. Posterior extremity produced below middle in a sub-rectangular, broadly rounded beak; dorsal part of posterior margin, which is distinctly concave (Pl. III, fig. 2) or almost straight, forms with dorsal margin a broadly rounded, but very distinct, more or less gibbous corner. Ventral margin almost straight, slightly

sinuated in front of middle, and joins posterior without forming any corner. On posterior beak-like process and just antero-ventrally to this, margin of valve furnished with a varying number (four to ten) of teeth, the shapes and sizes of which are rather variable. Right valve (text fig. XIX, 1): Differs from left one mainly in the following respects: Slightly smaller; anterior margin slightly depressed above eye; dorsal margin very slightly or not at all depressed behind greatest height of valve; ventral margin slightly more sinuated in front of middle. Seen from below and from above (Pl. III, figs. 6, 7 of female): Widest at about or somewhat behind middle. Side contours are somewhat irregular, in some specimens even somewhat more so than in the mentioned figures; converge gently towards front end and fairly abruptly behind; sometimes, when dorso-posterior ridge is relatively prominent, as in Pl. III, fig. 6, the posterior taper is even quite abrupt. Anterior extremity broadly pointed, posterior in most cases somewhat more rounded. Sculpture of surface rather constant; slight variations, however, found in the number, shape, size, and arrangement of depressions, as well as in the width and height of the ridges separating depressions; especially the last-mentioned variations alter the appearance of shell. Two valves may at first sight look quite different, but a close examination of structural details will show that the general type of sculpture is about the same. Just inside and about parallel to margin of shell, there is a rather broad, low, and rounded ridge, which runs along entire anterior margin and extends along a longer or shorter part of dorsal margin (Pl. III, fig. 6, shell seen from above). A similar, somewhat narrower, ridge runs from near eye steeply and slantingly forwards and downwards, joining the anterior ridge at about half the height of shell. Ventral ridge one-sided, its ventral slope more or less concave; usually well developed along entire ventral margin of shell, ending posteriorly in one or two narrow spurs, on postero-ventral beak of shell. From a point somewhat below and posterior to eye, a rather strong ridge runs slantingly upwards and backwards, forming, in most specimens, a rather regular curve; when shell is seen from the side, this ridge, which has a very steep dorsal slope, covers a rather great part of the posterior half of dorsal margin of



Text fig. XIX. *Cythereis (Cythereis) glauca*, n. sp., not type.

1. Right valve from the side, ♂. ×76.
2. Left valve from the side, ♀. ×83.
3. Chitinous support of proximal part of left second antenna and of the joint-like process onto which this is attached; seen from lateral side. The heavy strip to the left with a short branch near the middle belongs to the antenna; the rest to the joint-like process. ♂. ×410.
4. Distal part of second endopodite joint of right second antenna seen from lateral side, ♂. ×405.
5. Right genital verruca and furca, from lateral side, ♀. ×475.
6. Lower lip; the tongue-like part directed posteriorly, ♀. ×305. California, Carmel Bay.

shell; it ends at postero-dorsal corner of shell. At a rather great distance from and about parallel to posterior margin of shell, a similar ridge occurs (= posterior main ridge); it joins the last-mentioned ridge just in front of postero-dorsal corner of shell; in most specimens it also joins the ventral main ridge; sometimes, however, its ventral half is rather low and irregular (text fig. XIX, 2 of female), and its connection with the ventral ridge can even be broken. Just inside posterior margin and inside posterior half of ventral margin of shell, there is a low and rather inconspicuous ridge. Greater part of the surface of shell is covered with rather large, deep, and rounded to more or less angular cavities, arranged in about the manner shown in the accompanying figures. Just below postero-dorsal ridge, there are two longitudinal rows of cavities, separated by a rather narrow ridge; anterior cavity of upper row usually much larger than the others. On ventral half of shell cavities are arranged in more or less distinct rows which more or less distinctly radiate from center of valve. At about half the height of shell, there is a usually rather broad longitudinal zone, running somewhat upwards and backwards; this, like the ridges, is either perfectly smooth or marked with only a few very small cavities. Outside main ridges some more or less large cavities also occur (Pl. III, fig. 6). Bottoms of cavities either smooth or more or less rough. Hairs along margin about as in *C. (C.) montereyensis*, their number rather variable. Color of inner lamella of shell blue-greyish; when the undissected animal is regarded by reflected light, it has a bluish-black color. No dark fields to be detected, when shell is regarded by transmitted light (of course, with the exception of ridges).

First antenna: Of about same strength as in *C. (C.) montereyensis*, but fourth joint slightly longer relatively (see description of the subgenus). Pilosity: First joint about as in the mentioned species. Long hairs and the pectination along anterior edge of second joint more or less reduced; in some specimens there are but a few long hairs near proximal boundary of joint and a short distal pectination. Furthermore, the row of hairs on lateral side of the two distal joints sometimes rather poorly developed.

Second antenna (text fig. XIX, 3 and 4): Bristle on first endopodite joint somewhat shorter than in *C. (C.) montereyensis*. The medial one of the three bristles at about middle of posterior side of second endopodite joint has same type as the postero-lateral one of these bristles but is only about half as long or somewhat longer; both of these bristles finely pectinated. The shorter of the two anterior bristles of this joint furnished with a number of rather long hairs. Positions of these two groups of bristles about same as in Pl. XXXV, fig. 19, G. W. Müller, 1894. Along postero-distal edge of this joint, there is a number of very short, fine hairs. The longitudinal row of hairs on medial side of protopodite seems to be absent in some specimens.

Mandible: Masticatory joint: The next to the posterior pair of teeth of pars incisiva about as large as the adjoining pairs. On anterior side of dorsal half of this joint, there is a rounded hump. Endopodite: First joint: The two short ventro-distal bristles relatively short, being only about half as long as in text fig. VII, 9 of *C. (C.) montereyensis*. The dorso-distal bristle of this joint relatively long; usually somewhat longer than the longest bristles of distal joint. The longitudinal row of hairs on medial side of second joint seems to be absent at least in some specimens.

Maxilla: The four dorso-distal bristles on first joint of palp almost naked.

Fifth limb: Exopodite usually slightly longer, when compared with protopodite, than in *C. (C.) montereyensis*; and in some cases it has not so strong walls as in this species. Bristle on posterior side of protopodite has about same type as in *C. (C.) montereyensis*, ♂. Bristle on the second exopodite joint distinctly weaker. End claw almost naked.

Sixth limb: Exopodite somewhat longer relatively than in *C. (C.) montereyensis*; relative lengths of joints about as follows:

$$\text{Protopodite } \frac{8}{13} \quad \text{Exopodite I. } \frac{8}{9.5} \quad \text{II. } \frac{8}{6.5} \quad \text{III. } \frac{7}{6.5}$$

Of the three bristles on anterior side of protopodite, the two distal ones are somewhat shorter than in *C. (C.) montereyensis*; the one at about middle about as long as this side.

Other bristles of this limb about as in male of the mentioned species. End claw almost naked.

Seventh limb: Exopodite usually slightly longer, when compared with protopodite, and perhaps slightly more slender than in *C. (C.) montereyensis*. Protopodite: The proximal bristle on anterior side somewhat better developed than in the mentioned species, but still almost vestigial; the middle one of the three bristles on this side usually somewhat shorter than this side; the bristle at knee also in most cases somewhat shorter than in *C. (C.) montereyensis*. Bristle on posterior side of this joint about as long as in the mentioned species or but slightly shorter. Exopodite: Bristle of first joint has about same type as corresponding bristle in *C. (C.) montereyensis*, and is about as long as distal height of this joint, or slightly longer or shorter. End claw sometimes about as strong as in *C. (C.) montereyensis*, sometimes slightly weaker.

Brush-shaped organ: Has about same type as in *C. (C.) montereyensis*, but is slightly broader and more rounded distally than in figure 18 of this species.

Penis (Pl. VI, fig. 4): Vas deferens has spiral thickening. Ductus ejaculatorius has a rather short, free tube. Copulatory appendage rather short, of about same type on both penes.

Description: Female—

Shell (text fig. XIX, 2 and Pl. III, figs. 2, 6, 7): Length, 0.64 to 0.72 mm., thus somewhat smaller than the male; length: height, about 1.80 to 1.86:1; length: breadth, about 2.3:1. Of about same type as that of male, but somewhat higher relatively. Sometimes serrulation of anterior margin of shell is so weak that it is almost indistinguishable.

Second antenna: The medial and postero-lateral ones of the three bristles at about middle of posterior side of second endopodite joint are about the same as in male. The shorter of the two bristles on anterior side of this joint nearly naked. Positions of these two groups of bristles and pilosity about same as in male.

Mandible: Resembles that of male; or the dorso-distal bristle of first endopodite joint is somewhat shorter, sometimes even of about same relative length as in text fig. VII, 9 of *C. (C.) montereyensis*.

Fifth limb: Bristle on posterior side of protopodite and the one on first exopodite joint are of about same types as in *C. (C.) montereyensis*, ♀.

Sixth limb: Bristle on posterior side of protopodite has about same type and size as corresponding bristle of fifth limb. Bristle of first exopodite joint about as in female of *C. (C.) montereyensis*.

Seventh limb: Bristle on first exopodite joint of about same type and relative length as in *C. (C.) montereyensis*, or slightly shorter.

Genital verruca: Somewhat irregular in shape, with a decided sinuation postero-ventrally (text fig. XIX, 5).

Transverse rows of spines on back of posterior part of body rather weak and irregular, sometimes even absent.

Remarks: All organs were closely examined in two mature males and three mature females. Of the remaining specimens the shells alone were measured and examined.

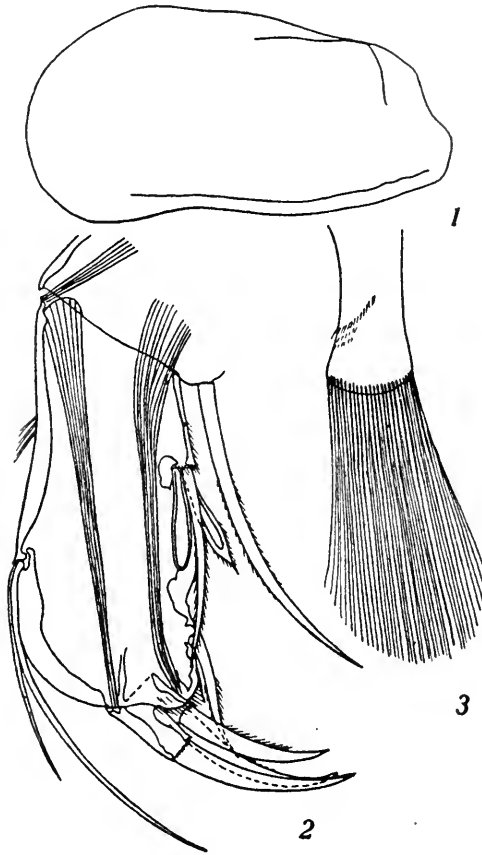
Habitat: **California: Pacific Grove**, just outside Hopkins Marine Station; in tide-pool, on calcareous algæ; 17.XI.1920: One juvenis, 0.59 mm. long. **Carmel Bay** (type locality): Tide-pool, on holdfasts of algæ; 23.XI.1920: One mature male, three mature females, and three juvenes (two of these juvenes were 0.58 mm. long; the third measured 0.43 mm.). Tide-pool, on roots of eelgrass; 20.I.1921: Two mature males, four mature females, and two juvenes (length of juvenes, 0.56 and 0.45 mm.). All specimens living, when taken. The females in sample from January 20th measured 0.70 to 0.72 mm.; longest female in sample of November 23d measured only 0.69 mm. All samples taken by the author.

C. (Cythereis) platycopa, new species

Plate VI, fig. 7; text fig. XX.

Description: Male—

Shell (text fig. XX, 1): Length, about 0.67 mm.; length: height, about 1.95:1. Seen from the side: Left valve has about same shape as in *C. (C.) pacifica*, but dorsal margin is not quite so evenly convex, and upper part of posterior margin is slightly sinuated. Postero-ventral beak of right valve has almost the same shape as in *C. (C.) pacifica*. Seen from



Text fig. XX. *Cythereis (Cythereis) platycopa*, n. sp., ♂, type.

1. Left valve from the side. $\times 85$.

2. Endopodite of left second antenna, from the lateral side.
 $\times 440$.

3. Brush-shaped organ. $\times 1170$. California, Pacific Grove.

below, shell has about same shape as in the mentioned species. Sculpture of surface was, unfortunately, partly destroyed in the recorded specimen; however, it appears to be almost perfectly of the characteristic type of *C. (C.) pacifica*. When shell is seen from the side, postero-dorsal ridge touches dorsal margin. (This great similarity shows that, even in this genus with its elaborate sculpture of the shell, it is impossible to de

termine a species by its shell alone.) Hairs of margin about as in *C. (C.) pacifica*.

First antenna: Fourth joint somewhat more elongated than in *C. (C.) montereyensis*, being about $\frac{10}{8}$, according to scale used in the subgeneric description. Claw of third joint slightly weaker than in most of the other species of the subgenus, and its tip reaches to about the point of attachment of the next claw. Bristle in front of the proximal claw of fourth joint rather short, being about one-third shorter than this claw. The short latero-distal spine of this joint somewhat smaller than in fig. 5 of *C. (C.) montereyensis*. I was unable to detect any longitudinal rows of hairs on first joint (absent?).

Second antenna (text fig. XX, 2): Left antenna—Posterior bristle of first endopodite joint almost as long as posterior side of second endopodite joint. Second endopodite joint: Does not grow narrower distally, as in all the remaining species of this subgenus examined by me; on the contrary, it is somewhat broader distally than proximally. The part of anterior margin, which is distal to the two bristles, is strongly but evenly convex. The group of three bristles on posterior side of this joint is situated somewhat proximally to middle; its postero-lateral bristle has a moderately strong pectination; its antero-lateral, sensorial, bristle is rather strikingly larger than usual; its medial bristle has about same size and shape as the antero-lateral one but is pointed distally, with thick walls, and furnished with short, fine hairs; the antero-lateral and medial bristles are about half as long as the postero-lateral bristle of this group. The postero-distal bristles of this joint are slightly more proximal than in most species of this subgenus. The longitudinal row of hairs on medial side of protopodite seems to be absent; and the distal hairs of second endopodite joint seem to be finer than in *C. (C.) montereyensis*. Right antenna—Differs from left one in having second endopodite joint distinctly less broadened distally; it is almost as narrow as in most species of this subgenus (proportion between the proximal and distal widths about 25:21).

Mandible: Masticatory joint: The next to the posterior pair of teeth of pars incisiva very small. There is a rounded hump on anterior side of dorsal part of this joint.

Maxilla: The long one of the four dorso-distal bristles of first joint of palp has short hairs or is almost naked.

Fifth limb: Relative lengths of joints, as well as strength of limb, about same as in *C. (C.) montereyensis*. Relative lengths and types of bristles about same as in male. Bristle on posterior side of protopodite seems, however, to be somewhat longer; and bristle on first exopodite joint perhaps slightly weaker. End claw almost naked. Distal pectination of joints very weak, or not developed at all.

Sixth limb: Relative lengths of joints, as well as strength of limb, about same as in *C. (C.) montereyensis*. Bristles about as in *C. (C.) montereyensis*, ♂. The middle one on anterior side of protopodite, however, about as long as this side. Bristle of first exopodite joint about two-thirds to three-fourths as long as second exopodite joint. End claw almost naked. Distal pectination on joints rather weak.

Seventh limb: First exopodite joint slightly more elongated than in *C. (C.) montereyensis*. Bristles of protopodite about as in *C. (C.) glauca*. Bristle on first exopodite joint about as long as corresponding bristle in *C. (C.) montereyensis* but distinctly weaker. Distal pectination of joints somewhat weaker than in the mentioned species.

Brush-shaped organ (text fig. XX, 3): Differs from that of *C. (C.) montereyensis* in the following respects: Somewhat shorter relatively with distal part broader and somewhat more rounded, and with distal bristles somewhat more numerous (about fifty to sixty) and somewhat longer relatively.

Penis (Pl. VI, fig. 7): Vas deferens has spiral thickening. Ductus ejaculatorius has a rather short, free tube. Copulatory appendage has same type in both penes; it is rather long and narrow; and its distal part is somewhat widened and rounded.

Remarks: The alcohol used to preserve the only recorded specimen of this species was, unfortunately, slightly acid, and softened the shell. Thus I became unable to give a certain and detailed description of the sculpture of the shell, and even my description and figure of the outline of the shell must be regarded as somewhat uncertain. The peculiar and interesting type of the second antenna and the fact that the other organs were in a good condition, allowing a detailed description,

overcame my hesitation to include this species in the present treatise.

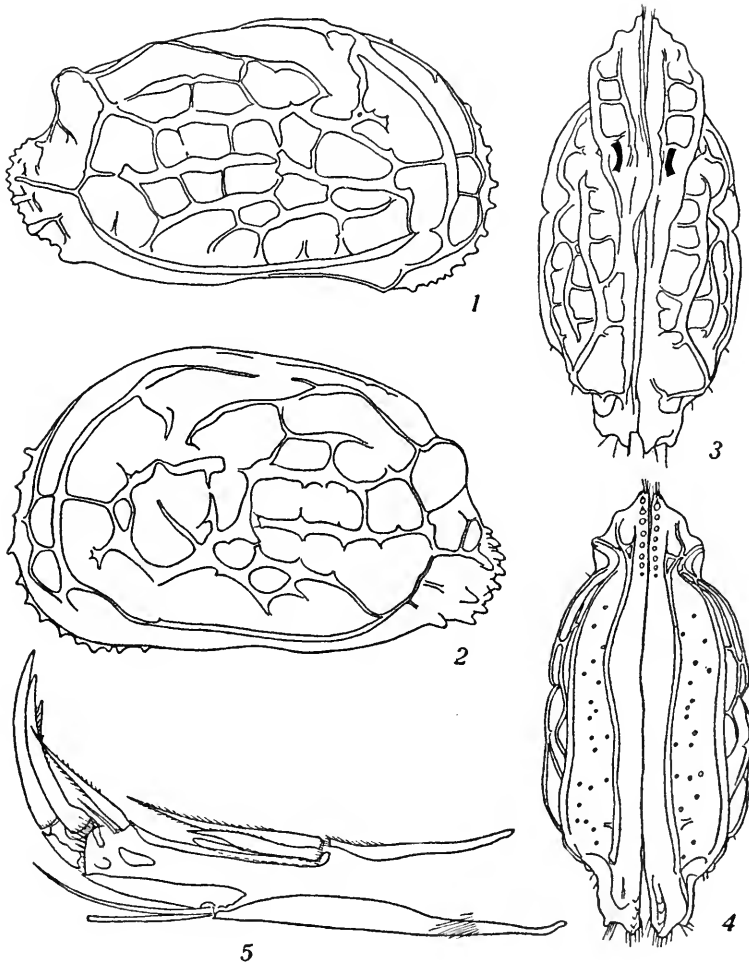
Habitat: California: Pacific Grove (type locality); depth, about 10 m.; 15.XII.1920: One mature male.

C. (*Cythereis*) *aurita*, new species

Plate VI, figs. 5 and 6; text fig. XXI.

Description: Male—

Shell: Length, 0.83 to 0.85 mm.; length: height, about 1.70 to 1.75:1; length: breadth, about 2:1. Seen from the side: Left valve: Sub-rectangular, highest in front of middle, at about anterior hinge-tooth, and with anterior half somewhat larger than posterior. Dorsal margin evenly and gently convex; sometimes of about same shape as in text fig. XXI, 2 of female, sometimes slightly more, sometimes slightly less convex than in this figure; slopes gently posteriorly and joins anterior and posterior margins with broadly and well rounded corners. Anterior margin of valve has about fifteen (twelve to sixteen) more or less powerful, short spines; in some (old ?) specimens, these spines were more or less worn out. Posterior extremity of valve produced, somewhat below middle, in a rather prominent but broadly, in some specimens somewhat irregularly, rounded beak-like process, which is furnished with a somewhat varying number of more or less strong spines of different sizes (about as in accompanying figures); the part of posterior margin, which is dorsal to this beak, gently sinuated to almost straight. Anterior half of ventral margin almost straight, posterior half gently convex. Right valve (text fig. XXI, 1): Rather strikingly lower than the left. Dorsal part of posterior margin somewhat more sinuated than in left valve. Same is true in the case of anterior half of ventral margin; the latter is sometimes, as in text fig. XXI, 1, marked off from anterior margin by a slightly developed corner. Seen from above and from below (text figs. XXI, 3 and 4), shell is oblong and has an irregular, somewhat rounded, hexagonal shape; with sub-parallel sides, which are rather deeply notched in middle and converge sinusously and rather abruptly towards the obliquely truncated extremities. Sculpture of surface very characteristic and ap-



Text fig. XXI. *Cythereis (Cythereis) aurita*, n. sp., not type.

1. Right valve from the side, ♂. ×77.
2. Left valve from the side, ♀. ×81.
3. Shell from above; anterior end above, ♂. ×68.
4. Shell from below; anterior end above, ♂. ×68.
5. Two distal joints of endopodite of left second antenna, from medial side, ♂. ×375. California, Pacific Grove.

parently rather constant; at any rate it showed but slight variations in specimens examined. Generally speaking, the only variations established were rather slight differences in shapes and heights of ridges (main ridges, as well as ridges separating depressions); sometimes two depressions were united, the dividing ridge being absent; or an additional depression was more or less well developed. As a rule, the sculpture was of about the type shown in text fig. XXI, 1. Although figures are not shaded, they presumably give a fairly clear idea of sculpture; it should be kept in mind that the narrow ridges in these figures, i.e., generally speaking, the vertical ones, are more or less low; the broad, horizontal, on the other hand, are more or less high. Along and about parallel to anterior margin of shell, two rather narrow ridges are found, one fairly low close by margin, and one high and sharply marked at some distance inside the other; these ridges are united by a few (three or four), usually low ridges; the outer one of them is continued by a low ridge along ventral margin; the inner one sometimes joins main ventral ridge. Close by dorsal margin of shell, there is a rather marked ridge, which on left valve continues almost along entire margin, on right valve only along its anterior half. Ventral main ridge high, rather narrow, and connected with posterior main ridge. Posterior main ridge runs at a distance from posterior margin of shell somewhat greater than average distance between ventral ridge and ventral margin of shell. Ventral and posterior main ridges of about same type, and they form together almost an arc; from this arc one to three spur-like, rather low ridges issue to posterior beak-like process of shell. At about postero-dorsal corner of shell, posterior ridge is connected with a somewhat ear-shaped, irregular ridge (from which character the species has been named); this ridge surrounds a rather deep depression and, when shell is seen from the side, often covers margin of shell. From a point somewhat below eye, a narrow and high ridge runs in a more or less irregular curve upwards and backwards, and joins the ear-shaped postero-dorsal ridge; in the low right valve, this ridge partly covers dorsal margin of valve, when the latter is seen from the side; not so, however, in the case of left valve. The part of the surface inside the main ridges is covered with rather large

and very deep depressions of irregular shapes, arranged more or less distinctly in a few longitudinal rows and divided by rather narrow and in most cases very marked ridges. The longitudinal of these separating ridges are about as high as main ridges; most of the vertical ones are frequently somewhat, though rather slightly, lower; heights of vertical walls, however, somewhat variable. Pores of surface about as in *C. (C.) montereyensis*; it is to be noticed that the small, irregularly scattered rings of text fig. XXI, 4 represent pores, and those arranged in rows along anterior part of margin represent spines. Hairs along anterior margin and along anterior part of ventral margin of shell are about of the same number as, or slightly more numerous than, in *C. (C.) montereyensis*; furthermore, they may be somewhat narrower and longer than in this species. Hairs along margin of posterior beak-like process of shell somewhat fewer than in the species mentioned, and, as in the case of those along anterior margin of shell, somewhat narrower. The part of the shell inside inner line looks yellowish-brown (due to color of inner lamella); outside this line valves are more or less milky white.

First antenna: Fourth joint somewhat more elongated than in *C. (C.) montereyensis*, being about $\frac{9}{8}$, according to scale used in description of the subgenus. Long claws are somewhat, though rather slightly, longer relatively than in most species of this subgenus. Bristle in front of the proximal claw of fourth joint relatively short, being about one-third to one-half shorter than the mentioned claw. Short antero-distal spine of this joint very small, being only about half the size of this claw in fig. 5 of *C. (C.) montereyensis*. The two long distal claws, perhaps, not so strong distally as in this figure. Pilosity: On lateral side of first joint there is a longitudinal row of hairs similar to that in *C. (C.) montereyensis*. On medial side of this joint, however, such a row seems always to be absent. Long hairs on anterior side of second joint somewhat reduced in number.

Second antenna (text fig. XXI, 5): Second endopodite joint somewhat more slender and also somewhat longer relatively than in *C. (C.) montereyensis*. Relative lengths of joints about as follows:

Protopodite $\frac{10}{9}$ Endopodite I. $\frac{7}{3}$ II. $\frac{18.5}{16}$ III. 2

The medial one of the three bristles at about middle of posterior side of second endopodite joint somewhat irregularly lanceolate, somewhat more than half the length of the postero-lateral bristle of this group, has thick walls, and is furnished with fine, short hairs; the postero-lateral of these bristles has a moderately strong pectination; the antero-lateral bristle is somewhat longer than usual. Position of this group and of that on anterior side of this joint about the same as in Pl. 35, fig. 19, G. W. Müller, 1894. Claws of end joint somewhat longer than usual; the antero-distal one of them about four times as long as anterior side of end joint; the proximo-lateral one slightly shorter than the proximo-medial one. On both medial and lateral sides of protopodite, there is a longitudinal row of fine, rather short hairs.

Mandible: Masticatory joint: The next to the posterior pair of teeth of pars incisiva small. There is a rounded hump on anterior side of dorsal half of this joint. Ventro-distal bristle of second protopodite joint often furnished with but short hairs. Row of hairs on medial side of second endopodite joint seems sometimes to be represented only by a number of hairs of moderate length near distal boundary of joint.

Maxilla: The long one of the four dorso-distal bristles on first joint of palp is almost naked.

Fifth limb: Relative lengths of joints somewhat variable but usually about as follows:

$$\text{Protopodite } \frac{10}{13} \quad \text{Exopodite I. } \frac{7}{9} \quad \text{II. } \frac{6.5}{6} \quad \text{III. } \frac{6}{5.5}$$

First exopodite joint thus somewhat longer relatively than in *C. (C.) montereyensis*. Exopodite also somewhat more slender than in this species. Bristle on posterior side of protopodite about as long as in *C. (C.) montereyensis*, ♂, but non-annulated and naked or almost so. Other bristles about as in *C. (C.) montereyensis*. End claw perhaps slightly weaker. Distal pectination of joints relatively weak.

Sixth limb: Relative lengths of joints about as follows (according to scale used in fifth limb):

$$\text{Protopodite } \frac{12}{15} \quad \text{Exopodite I. } \frac{9.5}{11.5} \quad \text{II. } \frac{7.5}{6.5} \quad \text{III. } \frac{7}{6.5}$$

First exopodite joint thus somewhat longer relatively than in *C. (C.) montereyensis*. Moreover, exopodite slightly more slender than in this species. The middle one of the three

bristles on anterior side of protopodite about as long as this side; the other bristles, including that of first exopodite joint, about as in female of *C. (C.) montereyensis*. End claw weakly pectinated, almost naked.

Seventh limb: Relative lengths of joints about as follows (according to scale used in the two preceding limbs):

Protopodite $\frac{12}{15}$ Exopodite I. $\frac{12}{13.5}$ II. $\frac{7}{6}$ III. $\frac{7.5}{7}$

Thus first exopodite joint distinctly longer relatively than in *C. (C.) montereyensis*. Exopodite slightly more slender than in this species. The long bristles of protopodite usually about as in *C. (C.) glauca*; bristle of first exopodite joint about as in *C. (C.) montereyensis*. End claw is slightly weaker than in the last-mentioned species. The same is also true in the case of the two preceding limbs; differences, however, so small that they hardly can be reproduced in a figure on the scale used in this paper.

Brush-shaped organ: About intermediate between that of *C. (C.) montereyensis* and that of *C. (C.) platycopa*. Distal bristles distinctly longer than stem. No hairs appear to be present.

Penis (Pl. VI, figs. 5, 6): Vas deferens seems to have no spiral thickening; at any rate, I was not able to detect it. Ductus ejaculatorius has a rather short, free tube, the distal part of which is narrow. Copulatory appendage has nearly the same type in both penes; it is somewhat pointed distally and has a notch at about middle of ventral side.

Lips: Cross-strip of the A-shaped chitinous support above upper lip seems sometimes to be absent. Unpaired appendage of lower lip is, at least in some cases, somewhat irregular.

Description: Female—

Shell: Length, 0.74 to 0.83 mm.; length: height, about 1.6 to 1.7:1; length: breadth, about 1.9:1. Of about same type as in male (text fig. XXI, 2).

Second antenna: Second endopodite joint: The medial and postero-lateral ones of the three bristles of posterior side of joint are similar in structure, with rather fine pectination; the antero-lateral of these bristles perhaps slightly shorter than in male. Position of this group of bristles and that of group on anterior side of this joint about the same as in male. Pilosity also resembles that of male.

Fifth limb: Bristle on posterior side of protopodite about as in *C. (C.) montereyensis*, ♀.

Sixth limb: Differs from that of male in having posterior bristle on protopodite of about same type as that of the corresponding bristle on fifth limb in *C. (C.) montereyensis*.

Seventh limb: About as in male.

Genital verruca and hind part of body about as in *C. (C.) montereyensis*.

Remarks: Two males and three females were examined. The shells of all the recorded specimens were measured and examined.

Habitat: **California: Pacific Grove**, just outside Hopkins Marine Station (type-locality): In tide-pool, on calcareous alga; 17.XI.1920: One empty shell. On holdfasts of *Macrocystis*; depth, 2 m.; 23.XI.1920: Two males (one of which was dead, when taken), six mature females (living), and one empty shell. On holdfasts of *Macrocystis*; 28.I.1921: Eight specimens (two of which were dead when taken). Collected by the author.

Subgenus *Pseudocythereis*, new subgenus

Description:

Shell: With the same characteristics as in the subgenus *Cythereis*. The bristles along the anterior margin and along the anterior part of the ventral margin are narrow and either simple or bifurcate.

First antenna: Six-jointed, the fourth joint of the subgenus *Cythereis* being divided into two distinct joints. The number and positions of the bristles are the same as in the mentioned subgenus. The relative lengths of the bristles are somewhat variable. The bristle of the third joint is relatively long; its tip reaches rather far beyond the point of attachment of the claw of the fourth joint. The pilosity is about the same as in the subgenus *Cythereis*.

Second antenna: Of somewhat varying types. With the same number of joints and with the same bristles as in the subgenus *Cythereis*. The exopodite is well developed in the males; three-jointed. The end claws of the endopodite are relatively long; the distal one of them is longer than half the

length of the second endopodite joint. The chitinous support of the proximal part of the protopodite of about the same type as in the subgenus *Cythereis*.

Mandible: Of about the same shape as in *Cytheretta rubra* (Pl. XXXIX, figs. 17 and 18, G. W. Müller, 1894), but with the same bristles as in the subgenus *Cythereis*. Masticatory joint: The toothed edge of the pars incisiva has a moderate width. Of its teeth, the anterior one is simple, smooth, triangular, and somewhat larger than the others. The five following ones are bifurcate; their two points of slightly different sizes; they decrease somewhat in size the more posteriorly they are situated. Behind these teeth there are two rather short, bristle-like appendages. Between teeth nos. 1 and 2, one or two rather fine and short bristles are to be found; and a similar, but somewhat shorter, bristle occurs between teeth nos. 2 and 3. The bristle on the anterior side of this joint has about the same type and relative length as in the subgenus *Cythereis*. The palp is four-jointed. Its two distal joints are subequal, the distal one being somewhat longer relatively than in the subgenus *Cythereis*. The second endopodite joint varies somewhat in shape. In *C. (Pseudocythereis) spinifera* it has about the same narrow shape as in the figure noted above; in *C. (P.) falcata* it has a shape about intermediate between that of the mentioned species and that of the subgenus *Cythereis* [*C. (C.) montereyensis*, text fig. VII, 9]. Second protopodite joint: The two bristles of about the same types and relative lengths as in the subgenus *Cythereis*. The epipodial appendage has five bristles of about the same types and relative lengths (see the descriptions of the species) as in fig. 17 of *Cytheretta rubra* referred to above; all these bristles have fine and rather long hairs. Endopodite: First joint: The dorso-distal bristle seems usually to be somewhat longer relatively than in the subgenus *Cythereis*, being about as long as the second endopodite joint. The four ventro-distal bristles have about the same types and relative lengths as in the figure of *Cytheretta rubra*, referred to above; the two shorter ones with some long hairs. Second joint: The two ventral bristles are of about the same types and relative lengths as in the subgenus *Cythereis*, but situated near the distal boundary of the joint. Of the eight dorso-distal bristles,

five are of the same long and narrow type as the corresponding bristles in the subgenus *Cythereis* and have about the same relative length as in this subgenus. Of these five bristles, four are non-annulated and naked or furnished with exceedingly fine and short hairs; the remaining one is annulated and has fine, short hairs. Of the three remaining ones of these eight bristles, two are rather short (about as long as the distal joint or somewhat shorter), non-annulated or almost so, and furnished with short, fine hairs. One, situated somewhat ventrally and medially to the others, is rather slightly longer than the distal joint, non-annulated, and furnished with a number of long hairs. (This last bristle evidently corresponds to the long, annulated dorso-distal bristle of this joint in the subgenus *Cythereis*.) Distal joint: With four bristles. One of these is about twice as long as the distal joint and has about the same type as the long ventro-distal bristle of the preceding joint. The other three are rather weak, non-annulated, and about as long as or somewhat longer than this joint. One of them has long hairs, the other is naked or almost so. Pilosity: Of about the same type as in the subgenus *Cythereis*. Second endopodite joint: The hairs in the row of hairs on the medial side are moderate in length. Dorsally to this row another longitudinal row of moderately long hairs occurs. Along the lateral side of the distal joint, there is a longitudinal row of rather long hairs, and similar hairs also occur medio-distally.

Maxilla: The epipodial appendage has about the same type and the same number (sixteen) of marginal bristles as in the subgenus *Cythereis*. The endites and the endopodite about as in *Cytheretta rubra* (Pl. 39, fig. 11, G. W. Müller, 1894). Each of the three endites has seven bristles of moderate length and strength; the average length and strength about the same as in the case of the second and third endites of *C. (Cythereis) montereyensis* (text fig. VII, 13 of this species). First endite: Just as in the subgenus *Cythereis*, one bristle is somewhat longer than the others and situated somewhat proximally to these; five are rather narrow and but slightly widened basally; one is rather thick at the base. All these bristles are non-annulated or almost so; some are naked or almost so; some have fine and more or less long hairs. Second endite:

Five of the bristles are rather narrow and but slightly widened at the base; two are characterized by thick bases. Third endite: One or two have thick bases; the others are narrow with slightly widened bases. The bristles of the second and third endites of about the same types as those of the first endite; non-annulated or almost so; some naked or almost so; some furnished with fine, more or less long hairs. Palp: First joint: This has four more or less distinctly annulated dorso-distal bristles; the longest one of these is about as long as the dorsal side of this joint; the three others of somewhat different lengths, about half as long as the longest. The longest has fairly long hairs; similar hairs also occur on one or two of the short ones. Disto-laterally on this joint there are two bristles. These have about the same types and sizes as the corresponding bristles in the subgenus *Cythereis* and are situated on a small, scale-like process. Distal joint: Length slightly variable. With three rather weak distal bristles of somewhat different lengths in the various species; these bristles have hairs of moderate length or are almost naked. Pilosity: Near the dorsal margin of the first joint of the palp, there is a longitudinal row of rather long hairs. Hairs also occur (at least sometimes) on the second and third endites.

Fifth limb: Of about the same shape and with the same bristles as in the subgenus *Cythereis*. Of the two bristles at about the middle of the anterior side of the protopodite, the short one is situated somewhat proximally to the other. There is no complicated chitinous support at the knee (such as is to be found in the subgenus *Cythereis*).

Sixth and seventh limbs: Of about the same types and with the same bristles as in the subgenus *Cythereis*. There is no complicated chitinous support at the knee. The armament of the end claw and of the second exopodite joint sometimes of rather aberrant types (*spinifera*).

Brush-shaped organ: Of about the same type as in the subgenus *Cythereis*.

Penis: The main type about the same as in the subgenus *Cythereis*. For the same reasons as in the mentioned subgenus, it may be convenient to postpone a detailed description of this organ.

The furca of the male has the same bristles as in the subgenus *Cythereis*. The size of the verruca varies.

The larger part of the chitinous skeleton has a yellowish color; frequently a light yellowish color.

Remarks: Although the two members of the subgenus agree in some fairly important respects, they show so many differences that I am very doubtful as to their assignment to the same subgenus. Some of the similarities, e.g., the number of joints in the first antenna and the absence of the complicated chitinous supports at the knees of the fifth, sixth, and seventh limbs, presumably are primitive. The assignment of *C. (P.) falcata* to this subgenus should be regarded as tentative.

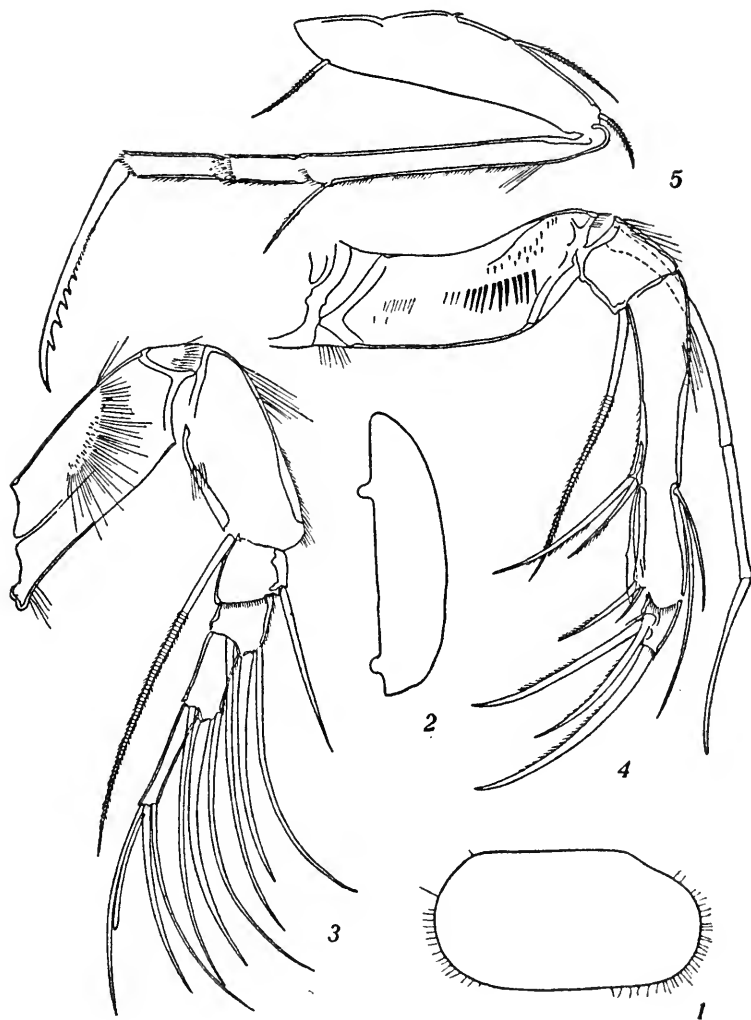
The type of this subgenus is *C. (P.) spinifera*.

C. (*Pseudocythereis*) *spinifera*, new species

Plate II, fig. 8; Plate V, fig. 5; text fig. XXII.

Description: Male—

Shell (Pl. II, fig. 8): Length, about 1.05 to 1.06 mm.; length: height, about 1.9:1; length: breadth, about 1.97:1. Seen from the side: Left valve: Dorsal and ventral margins almost straight and sub-parallel to each other; the dorsal has a slight hump just above eye and is marked off from posterior margin by a distinct but rounded corner. Anterior margin lacks teeth and crenulation. Posterior margin and posterior part of ventral margin well rounded, forming almost an arc; without teeth or crenulation. Right valve (text fig. XXII, 1): Differs from left mainly in the following respects: Somewhat lower; upper part of anterior margin somewhat more flattened, slightly sinuated; no distinct hump above eye; and postero-dorsal corner of valve somewhat less distinct. Seen from above (text fig. XXII, 2), shell is ovate, broadest at about middle, its posterior extremity somewhat more broadly rounded than anterior, and its side-contours fairly evenly curved. Surface covered with numerous closely-set, polygonal excavations of various shapes, of moderate size, subequal, and of moderate depth; some excavations arranged in rows more or less distinctly parallel to margin of shell. Bottom of each excavation marked by a number of small,



Text fig. XXII. *Cythereis* (*Pseudocythereis*) *spinifera*, n. sp., ♂. 3-5, From type specimen.

1. Right valve from the side. $\times 33$.
2. Right valve from above. $\times 35$.
3. Left first antenna from the medial side. $\times 220$.
4. Left second antenna from the medial side. $\times 220$.
5. Left seventh limb from the medial side. $\times 145$. S. A. E., station 24.

more or less rounded pits. Along anterior margin and along anterior part of ventral margin, there are about forty to fifty narrow, simple bristles of moderate length. Along posterior margin of shell, there is a number of similar bristles. When shell is regarded by transmitted light no dark fields are to be detected.

First antenna (text fig. XXII, 3): Of moderate strength and length, rather slender, most of the joints with rather thin walls; second and third joints, however, have walls of moderate thickness. Relative lengths of joints about as follows:

$$\text{I. } \frac{14}{17} \quad \text{II. } \frac{13}{10} \quad \text{III. } \frac{3}{5} \quad \text{IV. } \frac{4}{2} \quad \text{V. } \frac{5}{5} \quad \text{VI. } \frac{6.5}{7}$$

Bristle of second joint of about same type as in the subgenus *Cythereis*, distinctly annulated, its tip reaching somewhat beyond tip of antenna. Bristle of third joint moderate in strength, its length subequal to total length of anterior sides of the two distal joints. Of the three antero-distal bristles of fourth joint, one is rather strong, about as long as total length of the three distal joints, and slightly curved; the two others of moderate strength, subequal, and somewhat longer than the first. Three of the four bristles of fifth joint of about same types and lengths as the three bristles of fourth joint; the middle, claw-like one of them, just as the corresponding bristle of fourth joint, situated on a short, verruciform process; the remaining one of these four bristles is lateral and very weak and short, its length being subequal to the proximal width of the distal joint, and it points in about the same direction as the other bristles of this joint. Of the four bristles of the distal joint, the anterior is moderate in strength and about as long as total length of the three distal joints; one is a little shorter and stronger than the anterior. The two remaining ones are united at base (just as in the subgenus *Cythereis*); one of them has about the same length and strength as (or is slightly weaker than) the anterior of these four bristles; the other is narrowly claviform, sensorial, and usually somewhat more than half as long as its neighbor. All bristles of the four distal joints non-annulated and naked. Pilosity: On lateral side of first joint, there are two rows of rather short hairs running slantingly upwards and forwards, from a point somewhat dorso-distally to proximo-ventral cor-

ner of joint, to a point near middle of dorsal side. On medial side of this joint, at about middle of joint, there is a crescent-like row of hairs of different lengths. Second joint: Antero-proximally, there is a group of rather long hairs; along distal half of anterior side, a dense, rather short, and fine pectination occurs. Third joint: Pectination along medio-distal edge well developed. Fourth and fifth joints: Along entire anterior sides of these two joints, somewhat laterally, a dense, short, and rather fine pectination. On lateral side of end joint, a longitudinal row of fine hairs occurs; this is more spaced than pectination of the two preceding joints.

Second antenna (text fig. XXII, 4): Of moderate size, slender, walls of joints rather thin. Relative lengths of joints about as follows:

Protopodite $\frac{14}{13}$ Endopodite I. $\frac{4}{3}$ II. $\frac{20}{18}$ III. 4

Exopodite rather slender and somewhat longer than endopodite; second and third joints either subequal, or the third is slightly longer; both of them somewhat shorter than first joint. Endopodite: Posterior bristle of first joint about as long as or slightly shorter than posterior side of second joint, annulated, and furnished with very short hairs. Second joint: The two bristles on anterior side are naked and situated somewhat distally to middle of this joint; one of them about twice as long as the other; the shorter extends to about distal boundary of this joint. The group of three bristles on posterior side of this joint situated just opposite or slightly distally to the two bristles on anterior side. Of these three bristles, the postero-lateral is of moderate strength and about half as long as anterior side of this joint or slightly longer. The medial one is somewhat weaker than and somewhat more than half as long as the postero-lateral. The antero-lateral bristle is about as long as or slightly longer than the medial; its proximal half is narrow, its distal half lanceolate. Of the two postero-distal bristles of this joint, one is about as long as and somewhat stronger than the medial of the three last mentioned bristles; the other rather weak and only about half as long. Distal joint: Distal claw moderate in strength and about half as long as anterior side of first and second endopodite joints. The two other end claws are of somewhat different lengths;

the shorter, lateral, one of them is somewhat longer than half the posterior side of second endopodite joint. All bristles of the two distal joints are non-annulated; those on anterior side of second endopodite joint and the sensorial one of the group of three bristles on posterior side of this joint are naked; the others are very finely pectinated. Pilosity: Proximo-ventrally on protopodite, there is a number of hairs. On medial side of protopodite, a longitudinal row of rather long and strong spines (number of spines somewhat variable) and a number of scattered small spines and fine hairs occur. Dorso-distally on this joint, there is a group of rather short hairs. Pilosity of exopodite and of endopodite about the same as in the subgenus *Cythereis*. Of the two distal plates of second endopodite joint, the medial one is furnished with pectination of moderate strength; the lateral one with very fine pectination.

Mandible: Masticatory joint: Between teeth nos. 1 and 2 on toothed edge of pars incisiva, only one bristle was detected. Epipodial appendage: Posterior bristle somewhat longer relatively than in *Cytheretta rubra* (G. W. Müller, 1894, Pl. XXXIX, fig. 17). The dorso-distal bristle of the first endopodite joint with a moderate number of long hairs. The two short dorso-distal bristles of second endopodite joint about half as long as distal joint. Pilosity: At distal end of the longitudinal row of hairs on medial side of second endopodite joint, there is a number (about seven) of rather long spines, which sometimes are rather weak.

Maxilla: Length of distal joint and of its bristles about the same as in *Cytheretta rubra* (G. W. Müller, 1894, Pl. XXXIX, fig. 11).

Fifth limb: Of about same type and relative size as in *Cytheretta rubra* (G. W. Müller, 1894, Pl. XXXIX, fig. 9); the two distal joints subequal, and first exopodite joint somewhat longer than the second. Protopodite: Bristles on anterior side (including those at the knee) of about same types and relative lengths as in *C. (Cythereis) montereyensis* or slightly longer; the next to the proximal bristle somewhat stronger than the others; bristles at the knee of subequal thickness. Bristle on posterior side of this joint about as long as or somewhat longer than distal joint, swollen at base, and furnished with long hairs. Exopodite: Bristle of first joint

about as long as or slightly shorter than second joint, rather weak, slightly annulated, and furnished with short, fine hairs, almost naked. End claw naked or almost so and has about the same length, strength, and shape as in the figure mentioned above. Pilosity: Of about same type as in *C. (Cythereis) montereyensis*; ventral side of exopodite almost naked.

Sixth limb: Differs from fifth limb mainly in the following respects: Somewhat larger, and first exopodite joint about as long as total length of the two distal joints. Protopodite: Bristles about of same types and relative lengths as in the mentioned species. (Of course, there is only one bristle at the knee.) Bristle on posterior side of this joint, however, rather narrow and sometimes furnished with short hairs. Exopodite: Bristle on first joint sometimes somewhat, though but slightly, longer relatively. End claw as weak as that on fifth limb but somewhat longer, being about as long as total length of the two distal joints. Pilosity: On posterior side of protopodite near the bristle, there is a small group of rather long hairs.

Seventh limb (text fig. XXII, 5): Somewhat more elongated than sixth limb (ratio between lengths of exopodites of sixth and seventh limbs, about 7:10). First exopodite joint distinctly longer than total length of the two distal joints (about 3:2); the two distal joints subequal. Protopodite: Of the three bristles on anterior side, the proximal is almost vestigial; tip of the middle one reaches to about distal boundary of joint; and the distal one (at the knee) is about half as long as the middle one. Bristle on posterior side of this joint about as long as, or somewhat shorter than, the middle of the bristles on anterior side of joint. The three well-developed bristles are rather weak, annulated, and furnished with short, fine hairs. Exopodite: Bristle on first joint about as long as, or somewhat longer than, second joint, rather weak or of moderate strength, non-annulated, and furnished with short, fine hairs. End claw fairly powerful, somewhat longer than total length of the two distal joints, and armed with a number of spines which increase in size and strength the more distally

they are situated. Proximal spines are fine, the four or five distal ones are strong. Distances between distal spines rather great, subequal to lengths of spines: proximal spines closely-set: distal spine situated two to four times its own length from tip of claw. Pilosity: Protopodite seems to be naked except for a fine disto-lateral pectination. Exopodite: Along ventral side of first joint, there are four fields of short, fine hairs, proximally to which a group of rather long hairs occurs. Distally this joint is pectinated; pectination well developed on lateral side of joint, weak on medial side. The second joint has, ventrally, fine, short hairs; medio-distally, a fine pectination; and latero-distally, a series of spines, some of which (about four to five) are strong. Distal joint has a field of fine, short hairs on ventral side and is pectinated distally; pectination well developed on lateral side of joint, weak on medial side.

Brush-shaped organ: Somewhat wider than in *C. (Cythereis) montereyensis*. The distal bristles about as long as stem. No row of hairs seems to be present.

Penis: Both organs are of about type shown in Pl. V, fig. 5. Vas deferens has spiral thickening. Ductus ejaculatorius short and points downwards. Horn-like part is long and extends along entire ventral side of body of penis. Copulatory appendage has an irregularly and narrowly rounded postero-ventral process; anterior part of copulatory appendage of moderate length and height, and narrowly rounded distally.

Furca: The two long bristles are subequal; verruca, rather small.

Female: Unknown—

Remark: Three specimens were examined.

Habitat: **South Georgia**—S.A.E., Station 22, off **May Bay**, lat. 54° 17' S., long. 36° 28' W.; 14.V.1902; depth, 75 m.; clay with scattered algæ; temperature at bottom +1.5° C: One mature male. S.A.E., Station 24, off **Grytviken**, lat. 54° 22' S., long. 36° 27' W. (type-locality); 20.V.1902; depth, 95m.; clay: Two mature males (only chitinous parts left). On slides in the National Museum, Stockholm.

C. (*Pseudocythereis*) *falcata*, new species

Plate V, fig. 6; text fig. XXIII.

Description: Male—

Shell: Length, about 0.76 mm.; length: height, about 1.73:1. Seen from the side: Left valve (text fig. XXIII:1): Subtriangular, with greatest height situated somewhat in front of middle, at about anterior hinge-tooth. Anterior and posterior margins without teeth or crenulation; posterior extremity of valve rather narrowly and evenly rounded. Dorsal margin of valve gently arched, sloping rather steeply posteriorly; with a broadly rounded hump above eye and marked off from posterior margin by a broadly rounded corner. Ventral margin of valve almost straight, its posterior part forms with ventral part of posterior margin almost an arc. (Right valve broken in the only recorded specimen.) Sculpture of surface: Surface covered with closely-set, shallow, and angular excavations of moderate size; it seems not to have any strongly prominent (main) ridges. It is to be noted, however, that the greater part of the surface of the shell of the only specimen of this species examined was corroded; my description of the sculpture thus must be received with some reservation. Along anterior margin and along the anterior part of ventral margin of shell, there is a number of bifurcate bristles of moderate length or rather short. Along posterior margin of shell a few simple, narrow bristles occur, some of them moderate in length or rather short, some rather long. When shell is regarded by transmitted light, no dark fields are to be detected.

First antenna (text fig. XXIII, 2): Of moderate length and strength; second and third joints with rather strong walls. Relative lengths of the three proximal joints about the same as in *C. (Cythereis) montereyensis*; the fourth joint somewhat smaller than the third, its anterior side being about as long as or slightly longer than anterior side of third joint, its posterior side only about a third of the length of third joint; fifth joint strikingly narrower than its predecessor, its anterior and posterior sides subequal, about as long as or slightly shorter than anterior side of fourth joint; the distal joint about half as wide as its predecessor, of subequal width throughout its en-



Text fig. XXIII. *Cythereis (Pseudocythereis) falcata*, n. sp., ♂, type.

1. Left valve from the side. $\times 47$.

2. Right first antenna from the lateral side. $\times 230$.

3. Left second antenna from the lateral side. $\times 290$.

4, 5 and 6. The left fifth, sixth, and seventh limbs from the lateral side. $\times 155$. S. A. E. station 28.

tire length, and about as long as total length of fourth and fifth joints. Bristle of second joint has same type as the corresponding bristle in the subgenus *Cythereis* and is about as long as or slightly longer than total length of the four distal joints. Bristle of third joint of moderate strength and about as long as posterior side of second joint. Fourth joint: Of the three antero-distal bristles, the middle one is rather powerful, about as long as or somewhat longer than posterior sides of the three distal joints, and almost straight; the two others of moderate strength, subequal, and somewhat longer than claw. Fifth joint: Of the four bristles, three are of about the same type and lengths as bristles on fourth joint; the remaining one, corresponding to the short latero-distal spine in the subgenus *Cythereis*, is weak and about as long as distal joint. Claw and anterior narrow bristle situated on a rather short, verruciform process. Distal joint: Of the four bristles, two are of moderate strength and about as long as posterior sides of the three distal joints. The two remaining ones are (just as in the subgenus *Cythereis*) united at the base and both of them are narrow; one is about as long as, or slightly longer than, the first two of these four bristles; the other is claviform (sensorial) and about one-third shorter than its neighbors. All bristles of the four distal joints are non-annulated; the claw-like ones are very finely pectinated, the others naked or almost so. Pilosity: On lateral side of first joint only a few hairs are to be found. On medial side of this joint a pilosity of about same type as in *C. (Pseudocythereis) spinifera* occurs. Medio-distal pectination of third joint almost absent. Pilosity of the three distal joints somewhat weaker than in *C. (Pseudocythereis) spinifera*.

Second antenna (text fig. XXIII, 3): Of moderate length and rather strong. Relative lengths of joints about as follows:

Protopodite $\frac{14}{13}$ Endopodite I. $\frac{6}{4}$ II. $\frac{18}{15}$ III. 4

Exopodite rather slender and somewhat longer than endopodite; its distal joint relatively long; twice or almost twice as long as the middle joint, which is somewhat shorter than proximal joint. Endopodite: Posterior bristle of first joint relatively strong, about as long as anterior sides of the two distal joints, non-annulated or almost so, and furnished with

fine, short hairs. Second joint: Of the two bristles on the anterior side, the longer is somewhat longer than anterior side of this joint; the remaining one somewhat more than half this length; both naked or almost so, and they are situated somewhat distally to middle of joint. The group of three bristles on posterior side of this joint is situated somewhat distally to the two bristles on anterior side. The postero-lateral and the medial ones of them are about as long as, or somewhat longer than, posterior side of this joint and of moderate strength. The postero-lateral is somewhat curved, the medial is almost straight; both naked or almost so. The antero-lateral of these three bristles is narrowly claviform and somewhat more than half as long as its two neighbors. Of the two postero-distal bristles of this joint, one is rather powerful, about as long as or slightly shorter than the medial of the three bristles just described, and furnished with fine pectination; the other bristle moderate in strength, about half as long as its neighbor or slightly more, and naked or almost so. Distal joint: The two proximal claws about as long as the powerful postero-lateral bristle of the second joint; the medial one of them about as strong as, or slightly stronger than, the last-mentioned bristle, the lateral one moderate in strength. End claw has about same type and size as the medial one of the two proximal bristles of this joint. All claws of distal joint naked or almost so. Pilosity about the same as in *C. (Cythereis) montereyensis*. Hairs on second endopodite joint rather long. Distal pectination of this joint is fine on both sides of limb. It is to be noted that the distal plates of this joint are not developed.

Mandible: Masticatory joint: Between teeth nos. 1 and 2 on toothed edge of pars incisiva, there are two bristles. Epipodial appendage and dorso-distal bristle of first endopodite joint about as in *C. (P.) spinifera*. Second endopodite joint: The two short dorso-distal bristles about as long as distal joint. There are no spines on this joint.

Maxilla: Distal joint rather short, almost square; its bristles of somewhat different lengths, the longest about thrice as long as joint, the shortest about twice as long as joint.

Fifth limb (text fig. XXIII, 4): Exopodite somewhat shorter, when compared with protopodite, than in *C. (Pseudo-*

cythereis) spinifera; just as in this species, walls of joints are rather thin. Protopodite: Types and relative lengths of bristles on anterior side about as in *C. (Cythereis) montereyensis*, the proximal one, however, somewhat shorter relatively. Bristle on posterior side of this joint about as long as distal joint, rather broad and furnished with long hairs. Exopodite: Bristle on first joint not quite so long as second joint, of moderate strength, non-annulated, and furnished with short, fine hairs, almost naked. End claw moderate in strength, about as long as first exopodite joint, evenly curved, and naked or almost so. Pilosity about same as in the subgenus *Cythereis*. Distal pectination of joints exceedingly fine. On ventral side of first exopodite joint, there is one or two small groups of hairs of moderate length. Ventral sides of the two distal joints seem to be naked.

Sixth limb (text fig. XXIII, 5): Differs from fifth limb mainly in the following respects: Somewhat larger. Protopodite: Proximal bristle on anterior side short, only about half as long as corresponding bristle of fifth limb. (Of course, there is only one bristle at the knee.) Exopodite: Bristle of first joint almost naked and somewhat longer, being about as long as or slightly longer than second joint. Long hairs on posterior side of protopodite somewhat fewer.

Seventh limb (text fig. XXIII, 6): This differs from the sixth mainly in the following respects: First exopodite joint somewhat longer relatively, being about as long as total length of the two distal joints. Bristle on posterior side of protopodite narrow, annulated, furnished with fine, short hairs, and probably rather long (broken in the only specimen recorded). Bristle on first exopodite joint has fine, short hairs. End claw narrow, gently curved, finely pectinated, and about as long as total length of first and second exopodite joints. All joints furnished distally with pectination of moderate strength. Ventral side of exopodite naked or almost so; no long hairs to be found on protopodite.

Brush-shaped organ: Has about same type as in *C. (Pseudocythereis) spinifera*.

Penis: Right and left organs of about the type shown in Pl. V, fig. 6. Vas deferens has spiral thickening. Ductus ejaculatorius sickle-shaped (a character from which this

species has been named); its point directed upwards and forwards. Copulatory appendage rather large and fairly broadly triangular; its anterior extremity narrowly rounded; its postero-ventral process narrow and well pointed.

Furca: Verruca relatively large (about as long as postero-ventral process of copulatory appendage of penis), somewhat irregularly conical, and has a narrowly rounded point. Distally it has two bristles, one of which is somewhat shorter than the other. The short, third bristle located at about the middle of anterior side of verruca.

Female: Unknown—

Habitat: **South Georgia**—S.A.E., Station 28 (type-locality), lat. 54° 22' S., long. 36° 28' W.; 24.V.1902; depth, 12 to 15 m.; sand and algæ: One mature male.

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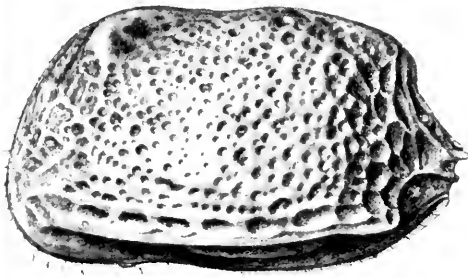
ABBREVIATIONS

- S. A. E. = Swedish "Antarctic" Expedition, 1901-03.
S. M. E. = Swedish Magellan Expedition, 1896.

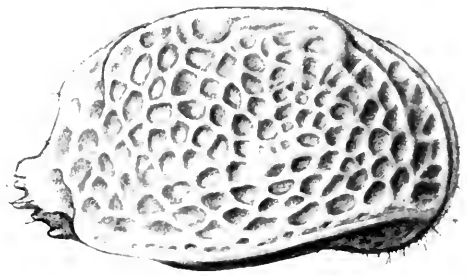
PLATE I.

- Fig. 1. *Cythereis (Procythereis) torquata*, n. sp., ♀, not type. Tierra del Fuego, Cape Valentyn. ×62.
- Fig. 2. *Cythereis (Procythereis) iganderssoni*, n. sp., ♀, not type. Tierra del Fuego, Cape Valentyn. ×69.
- Fig. 3. *Cythereis (Procythereis) robusta*, n. sp., ♀, type. S. A. E., station 28. ×70.
- Fig. 4. *Cythereis (Procythereis) radiata*, n. sp., ♀, not type. Tierra del Fuego, Borja Bay. ×77.
- Fig. 5. *Cythereis (Procythereis) polita*, n. sp., ♂, type. Tierra del Fuego, no definite locality. ×91.
- Fig. 6. *Cythereis (Cythereis) taniata*, n. sp., ♀, not type. S. A. E., station 46. ×117.
- Fig. 7. *Cythereis (Cythereis) taniata*, n. sp. var. *deliciosa* n. var., ♀, type. Tierra del Fuego, Puerto Harris. ×87.
- Fig. 8. *Cythereis (Cythereis) longiductus*, n. sp., ♂, not type. S. A. E., station 25. ×83.

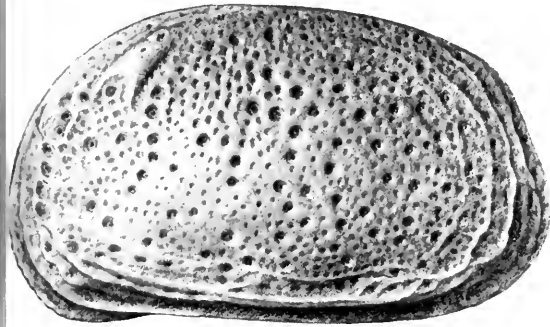
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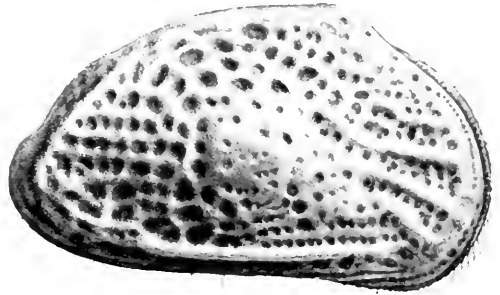
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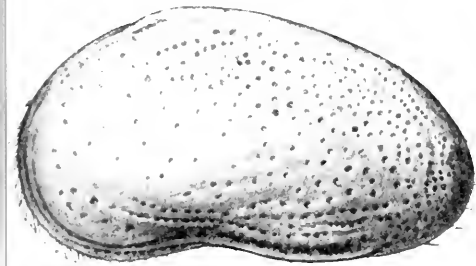
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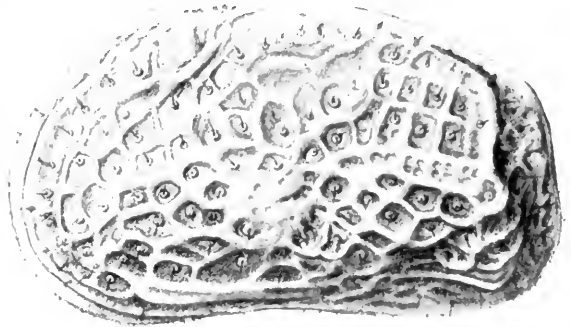
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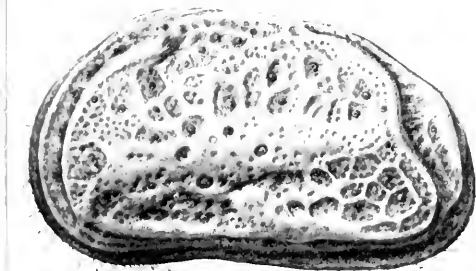
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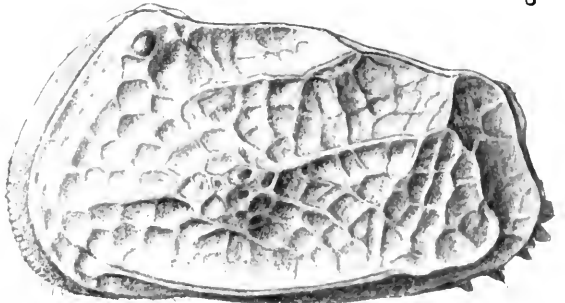
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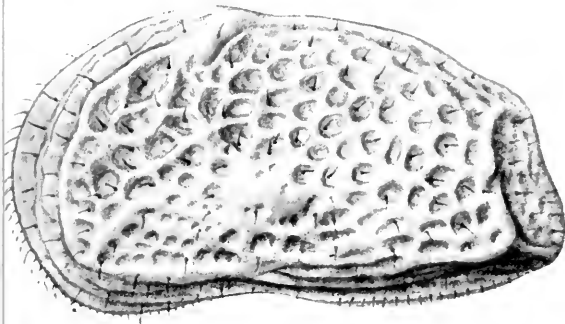


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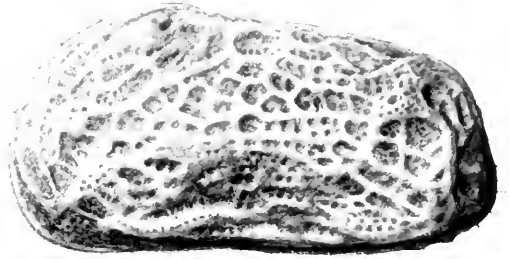
PLATE II.

- Fig. 1. *Cythereis* (*Cythereis*) *discophora*, n. sp., ♀, not type. S. A. E. station 46. ×109.
- Fig. 2. *Cythereis* (*Cythereis*) *mesodiscus*, n. sp., ♂, not type. Tierra del Fuego, Isla Nueva. ×83.
- Fig. 3. *Cythereis* (*Cythereis*) *mesodiscus*, n. sp., ♂, not type. Tierra del Fuego, Chubut, Puerto Madryn. ×87.
- Fig. 4. *Cythereis* (*Cythereis*) *megalodiscus*, n. sp., ♂, not type. S. A. E., station 25. ×90.
- Fig. 5. *Cythereis* (*Cythereis*) *frequens*, n. sp., ♀, not type. S. A. E., station 25. ×67.
- Fig. 6. *Cythereis* (*Cythereis*) *théeli*, n. sp., ♂, not type. Tierra del Fuego, Chubut. ×85.
- Fig. 7. *Cythereis* (*Cythereis*) *ephippiata*, n. sp., ♀, not type. S. A. E., station 46. ×94.
- Fig. 8. *Cythereis* (*Pseudocythereis*) *spinifera*, n. sp., ♂, type. S. A. E., station 24. ×67.

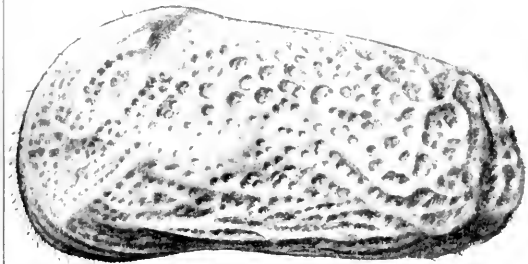
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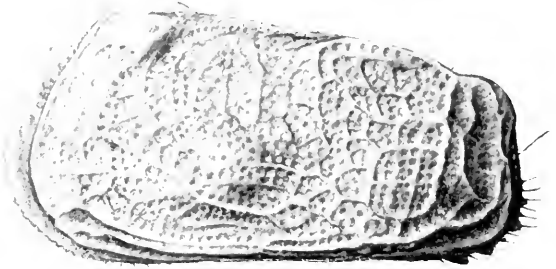
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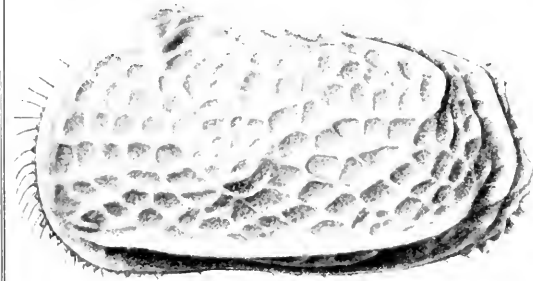
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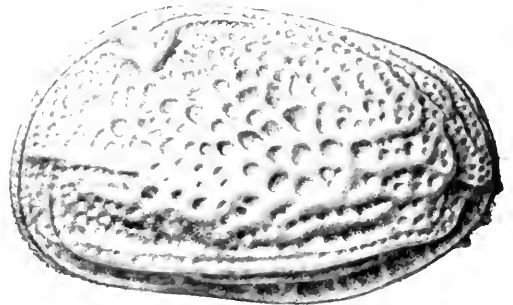
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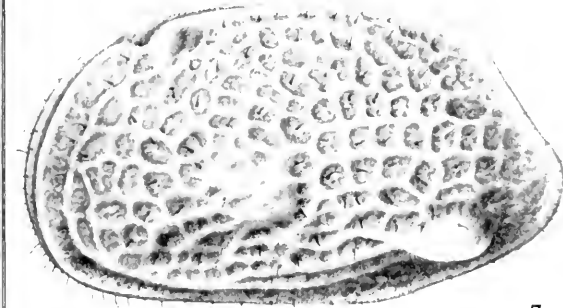
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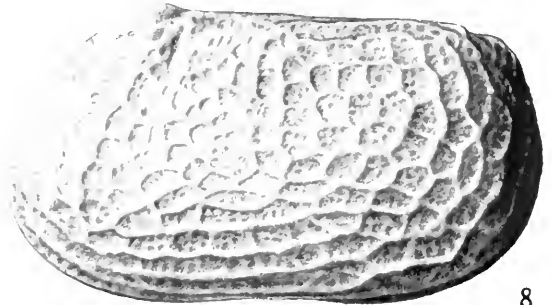
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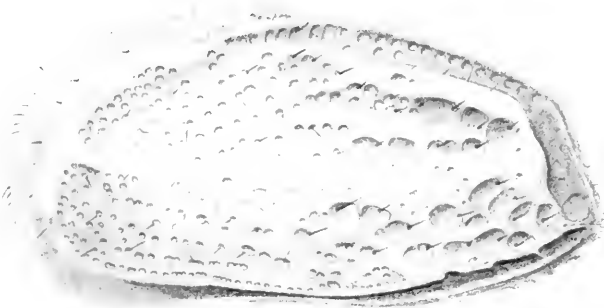


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PLATE III.

- Fig. 1. *Cythereis* (*Cythereis*) *pacifica*, n. sp., ♂, not type. Slightly too elongated. California, Carmel Bay. ×127.
- Fig. 2. *Cythereis* (*Cythereis*) *glauca*, n. sp., ♀, not type. California, Carmel Bay. ×116.
- Fig. 3. *Cythereis* (*Cythereis*) *ephippiata*, n. sp., ♀, not type. Sculpture of the surface of the shell, somewhat behind the middle. S. A. E., station 46. ×300.
- Fig. 4. *Cythereis* (*Cythereis*) *montereyensis*, n. sp., ♀, not type. Upper lip seen from in front; dorsal side up. California, Carmel Bay. ×400.
- Fig. 5. *Cythereis* (*Cythereis*) *montereyensis*, n. sp., ♀, not type. Upper lip seen from the left side; dorsal side up; line at the bottom indicates dorsal edge of lower lip. California, Carmel Bay. ×400.
- Fig. 6. *Cythereis* (*Cythereis*) *glauca*, n. sp., ♀, not type. Shell seen from above. Anterior end up. California, Carmel Bay. ×94.
- Fig. 7. *Cythereis* (*Cythereis*) *glauca*, n. sp., ♀, not type. Shell from below. Anterior end up. California, Carmel Bay. ×94.
- Fig. 8. *Cythereis* (*Cythereis*) *montereyensis*, n. sp., ♀, not type. Posteroventral portion of the left valve. California, Carmel Bay. ×230.

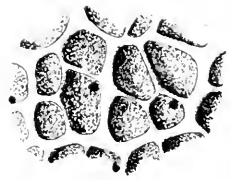
[All drawings made by the author.]



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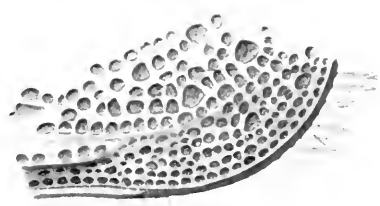
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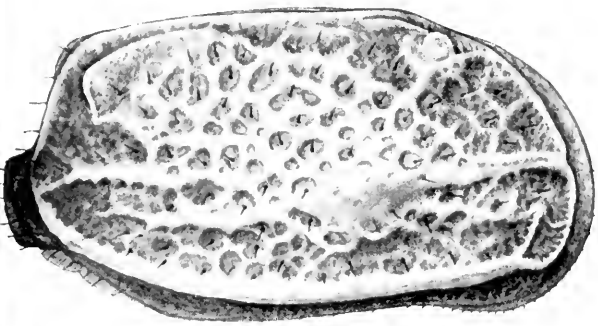


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PLATE IV.

- Fig. 1. *Cythereis (Cythereis) recurvirostra*, n. sp., ♂, type. Right shell from the side. Note the selvage along the postero-ventral margin. S. A. E., station 59. $\times 82$.
- Fig. 2. *Cythereis (Procythereis) torquata*, n. sp., type. Penis. Tierra del Fuego, Puerto Condor. $\times 140$.
- Fig. 3. *Cythereis (Procythereis) radia*, n. sp., type. Left penis from outside. Tierra del Fuego, Borja Bay. $\times 220$.
- Fig. 4. *Cythereis (Procythereis) folita*, n. sp., type. Right penis from outside. Tierra del Fuego, no definite locality. $\times 240$.
- Fig. 5. *Cythereis (Cythereis) taniata*, n. sp., not type. Left penis from outside. S. A. E., station 46, Falkland Islands. $\times 220$.
- Fig. 6. *Cythereis (Cythereis) longiductus*, n. sp., not type. Penis. S. A. E., station 25, S. Georgia. $\times 205$.
- Fig. 7. *Cythereis (Cythereis) mesodiscus*, n. sp., not type. Penis. Tierra del Fuego, Isle Nueva. $\times 200$.
- Fig. 8. *Cythereis (Cythereis) megalodiscus*, n. sp., not type. Penis. S. A. E., station 25, S. Georgia. $\times 250$.

[Fig. 1 drawn by Mr. G. Liljevall. The remaining figs. are photographs of which figs. 2-5, 7 were retouched by Mr. Liljevall, the others by the author.]



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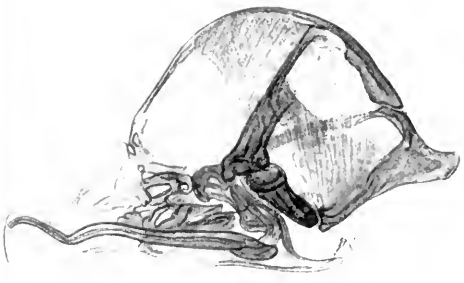
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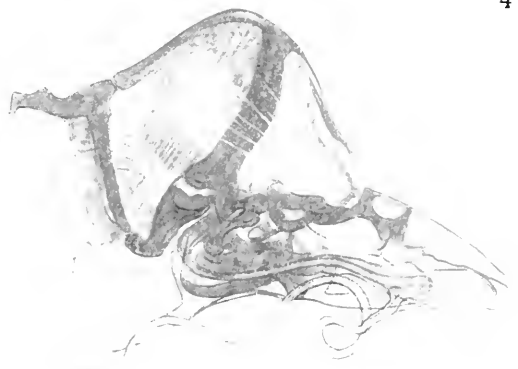
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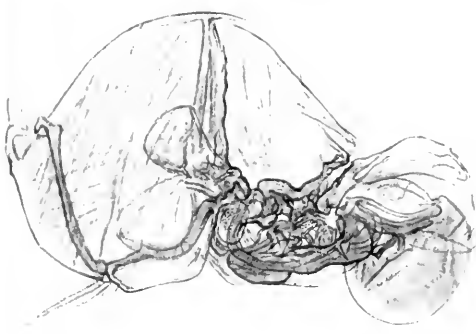
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PLATE V.

- Fig. 1. *Cythereis* (*Cythereis*) *frequens*, n. sp., not type. Right penis from outside. S. A. E., station 25, S. Georgia. $\times 145$.
- Fig. 2. *Cythereis* (*Cythereis*) *ephippiata*, n. sp., not type. Left penis from medial side. S. A. E., station 46, Falkland Islands. $\times 150$.
- Fig. 3. *Cythereis* (*Cythereis*) *théeli*, n. sp., not type. Right penis from outside. Tierra del Fuego, Chubut. $\times 170$.
- Fig. 4. *Cythereis* (*Cythereis*) *recurvirostra*, n. sp., type. Penis. S. A. E., station 59. $\times 160$.
- Fig. 5. *Cythereis* (*Pseudocythereis*) *spinifera*, n. sp., type. Penis. S. A. E., station 24, S. Georgia. $\times 130$.
- Fig. 6. *Cythereis* (*Pseudocythereis*) *falcata*, n. sp., type. Penis. S. A. E., station 28, S. Georgia. $\times 280$.

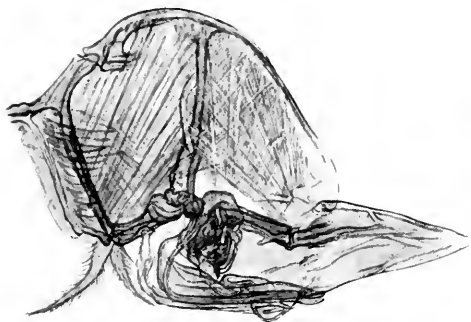
[All figs. are photographs, of which figs. 1-5 were retouched by Mr. G. Liljevall, fig. 6 by the author.]



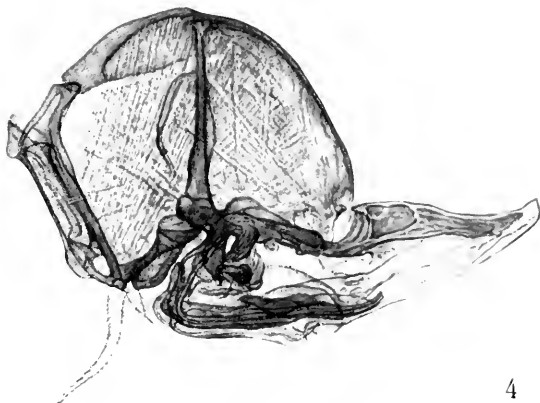
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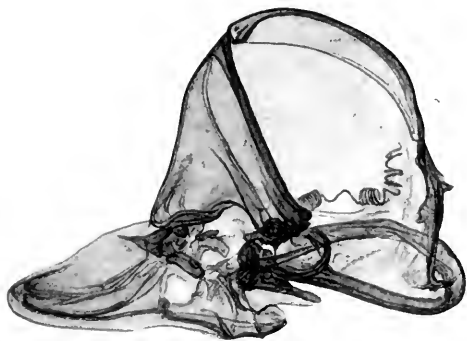
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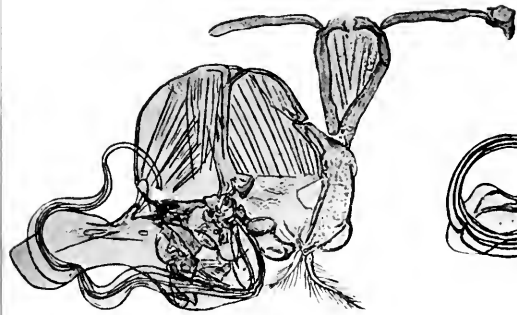


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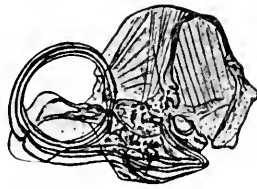
PLATE VI

- Fig. 1. *Cythereis* (*Cythereis*) *montereyensis*, n. sp., type. Penis. Carmel Bay, California. $\times 143$.
- Fig. 2. *Cythereis* (*Cythereis*) *montereyensis*, n. sp., Penis of specimen 0.52 mm. long. Pacific Grove, California. $\times 143$.
- Fig. 3. *Cythereis* (*Cythereis*) *pacifica*, n. sp., not type. Penis. Pacific Grove, California. $\times 143$.
- Fig. 4. *Cythereis* (*Cythereis*) *glauca*, n. sp., type. Penis. Carmel Bay, California. $\times 143$.
- Fig. 5. *Cythereis* (*Cythereis*) *aurita*, n. sp., not type. Left penis seen from the inner side. Pacific Grove, California. $\times 143$.
- Fig. 6. *Cythereis* (*Cythereis*) *aurita*, n. sp., not type. Right penis seen from the outside. Pacific Grove, California. $\times 143$.
- Fig. 7. *Cythereis* (*Cythereis*) *platycopa*, n. sp., type. Penis, erected. Pacific Grove, California. $\times 143$.

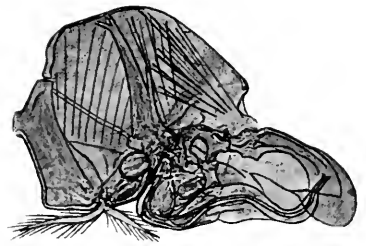
[All figs. are photographs retouched by the author.]



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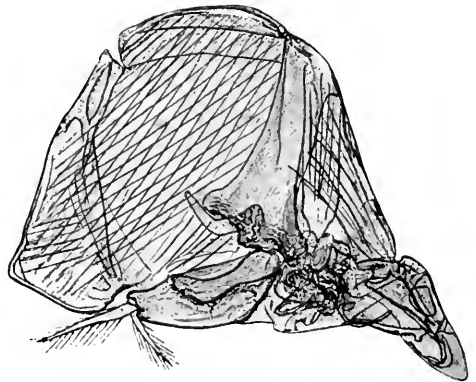
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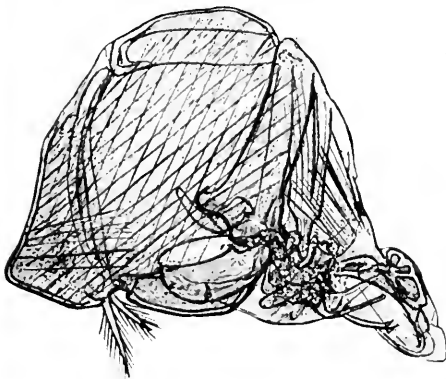
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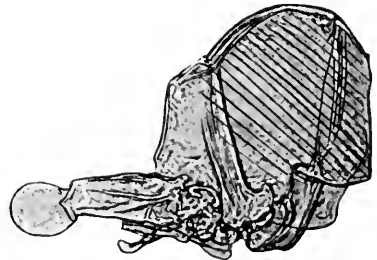
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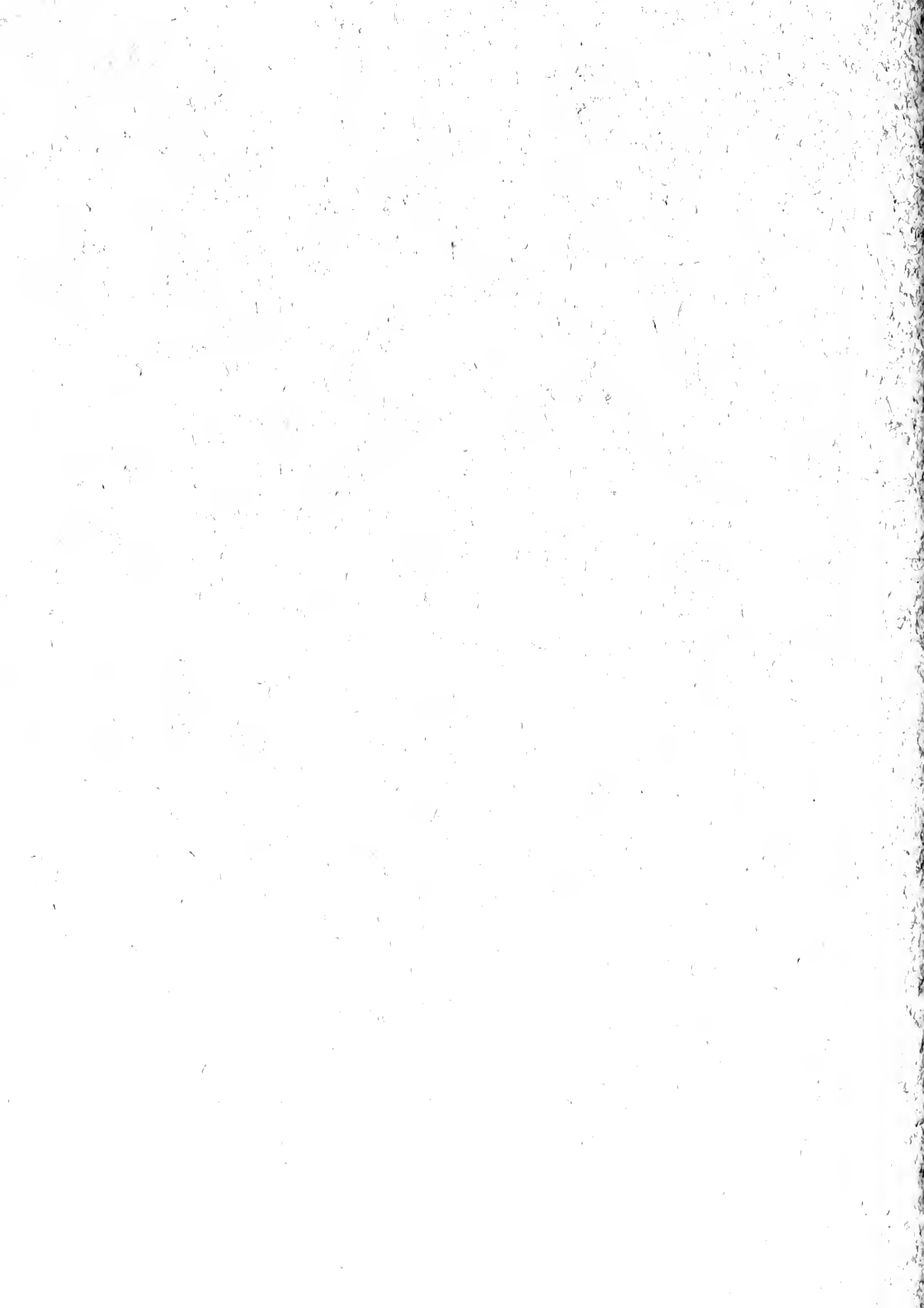
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