1907

**Holothuroids. French Antarctic Expedition (1903–1905): A
Translation of *Holothuries. Expédition Antarctique Française
(1903–1905)***

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Recommended Citation

Vaney, C. (2008). Holothuroids. French Antarctic Expedition (1903–1905): A Translation of *Holothuries. Expédition Antarctique Française (1903–1905)* (J. M. Lawrence, Trans.). Herizos Press, Tampa.

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FRENCH ANTARCTIC EXPEDITION

(1903–1905)

COMMANDED BY

Dr. Jean CHARCOT

NATURAL SCIENCES – SCIENTIFIC DOCUMENTS

C. VANEY

Holothuroids

PARIS
MASSONS ET C^{ie}, EDITEURS

120, Boulevard Saint-Germains, 129

Vaney, C. 1907. Holothuroids. French Antarctic Expedition. Translated by John M. Lawrence. © 2008. Herizos Press, Tampa.

VANEY

John Lamy
trouvé bien cordial
C. Vaney

OUVRAGE PUBLIÉ SOUS LES AUSPICES DU MINISTÈRE DE L'INSTRUCTION PUBLIQUE

SOUS LA DIRECTION DE

L. JOUBIN, Professeur au Muséum d'Histoire Naturelle

EXPÉDITION
ANTARCTIQUE FRANÇAISE
(1903-1905)

COMMANDÉE PAR LE

D^r Jean CHARCOT

SCIENCES NATURELLES : DOCUMENTS SCIENTIFIQUES

C. VANEY

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120, Boulevard Saint-Germain, 120

Translator's note.

Vaney is listed in this memoir as Maitre de Conférences de Zoologie de l'Université de Lyon at the time he studied the collection of the Expédition Antarctique Française. His name is listed in the Revue de l'Université de Lyon – No. 5 – Decembre 1930. He was a collaborator of René Koehler, Professor of Zoology at the university.

The commander of the expedition was Dr. Jean-Baptiste Charcot (1867-1936) who was also a medical doctor.

Three sites are listed for the holothuroid collection. Vaney's Booth-Wandel Island is a combination of Booth Island and Wandel Island. The island is in the northeastern part of the Wilhelm Archipelago. It was discovered and named Booth Island by a German expedition in 1873-1874. The Belgium Antarctic Expedition of 1897-1899 on the "Belgica" named it Wandel Island. This name is no longer used. Port Charcot is on the northern coast of Booth Island. Charcot named it after his father, Jean-Martin Charcot, a famous neurologist. Biscoe Bay is on the southwest coast of Anvers Island in the Palmer Archipelago. It was first charted by the Belgian Antarctic Expedition whose captain named it for John Biscoe. John Biscoe was an English mariner who commanded the first expedition that sighted what is now known as Enderby Land, Graham Land and Biscoe Bay. Biscoe may have landed there in 1832. Biscoe named Enderby Land after his employer and Graham Land after the First Lord of the Admiralty. Vaney's name for Biscoe Bay was Baie Biscoé.

Although Vaney did not make dedications for species names in the text, it would appear he named *Cucumaria turqueti* after a member of the scientific staff on the "Français", Dr. J. Turquet and *Psolus charcoti* for Dr. J.-B. Charcot, commander of the expedition.

Vaney expressed dismay he was hampered in studying the collection because specimens had been preserved in formaldehyde or acids. They often lacked calcareous ossicles and sometimes even the calcareous ring. He usually had only one specimen of each species. He had the luxury of twenty specimens of *Psolus granulatus* nov. sp.

Pagination in the original publication is indicated by numbers in bold brackets, e.g.: **[12]**

HOLOTHUROIDS

CLÉMENT VANEY

Professor Joubin has asked me to study the holothuroids collected by Expedition of Dr. Charcot. I must express to him all my thanks for the honor he has done me by confiding this task to me and for the kindness with which he has sent me certain specimens from the Museum of Paris.

The collection of holothuroids collected by the "Français" is most interesting. Although comprising only a small number of specimens, it has given me some very valuable records. Most of the species that make it up, and which I have been able to determine, are new. I regret not being able to identify all the material but their determination is made difficult and even often impossible because of the harmful action of the preserving fluid. I have already reported the dissolving effect of formaldehyde on calcareous ossicles of holothuroids and the shell of mollusks¹ Joubin² has made the same observation to the Société zoologique de France and Bell³ has observed identical changes in holothuroids collected by the "Southern Cross". One should thus formally prohibit the use of [2] formaldehyde for the preservation of holothuroids and, with greater reason, that of strongly acid liquids. Certain examples of the Charcot collection have been unfortunately treated with glacial acetic acid.

The disappearance of the calcareous plates under the influence of the preserving fluid has made identification very laborious because it has deprived us of one of the most useful characteristics of identification. Also, despite the various types of comparison put at our disposal by Joubin and Kœhler many of our identifications are uncertain. Sometimes we have been obliged to combine under the same name specimens that clearly have a large number of common characters but whose affinities could not be confirmed by the form of their ossicles. Moreover, to avoid complete confusion, we have described these doubtful specimens separately.

The holothuroids collected from the South Pole by Dr. Charcot contain only synallactids and cucumariids. They contain only a single species already described, *Psolus antarcticus* Philippi and the following nine new species:

SYNALLACTIDÉS:

Synallactes carthagei.

CUCUMARIIDÉS:

Cucumaria Antarctica.

--- *attenuata.*

--- *grandis.*

--- *irregularis.*

--- *lateralis.*

--- *turqueti.*

Psolus charcoti.

¹ Holothuries recueillies par M. Ch. Gravier sur la côte française des Somalis (*Bull. Mus. Hist. Nat.*, 1905, no. 3, p.186).

² *Bull. Soc. Zool. De France* (1905)

³ *Report on the Collections of Nat. History...of the "Southern Cross"* (1902); VIII, *Echinoderma*, ,p. 214.

--- *granulosus*.

It is necessary to add one species of non-identified *Synallactes* (?) and one probably new species of *Cucumaria* to this list.

Before going to the description of the new species, I must report some peculiarities shown by certain individuals of this collection.

Certain of the *Cucumaria* are of very large size. The specimens of *C. Antarctica*, completed contracted, are still 115 mm [3] in length. But the largest species is *C. grandis*, whose single specimen measures at least 300 mm in the length. The epithelium of these two species are greatly pigmented..

Among the specimens of this collection, we have found two new incubating holothuroids: *Cucumaria lateralis* and *Psolus granulosus*. Ludwig, who has summarized our knowledge of incubating echinoderms⁴, listed thirteen species of holothuroids among them, of which six belonged to Antarctic and subAntarctic regions. Our two new forms increase this preponderance by increasing the number of incubating species coming from the South Pole to eight.

The two new incubating holothuroids each have a special mode of incubation. In *Cucumaria lateralis* the eggs are enclosed in two internal lateral-dorsal pockets, identical to those of *Cucumaria glacialis* Ljungmann, and which open separately by an external pore. As for *Psolus granulosus*, it carries young embryos and eggs in different stages of development on its sole, inserted more or less completely into a kind of cutaneous warty swellings.

ASPIDOCHIROTES

SYNALLACTIDES.

1. *Synallactes carthagei* nov. sp.
(Fig. 7 a, b; fig. 27 a, b, cv, d; fig. 28 a, b)

No. 302. – Port-Charcot. Dredge, 40 m. – 1 specimen.

This single specimen is small and only 14 mm in length. The body (figl 7, b) is oval with a rounded posterior region. It ends anteriorly in a crown of ten very extended tentacles. Its greatest width is 8 mm nearly at the midpoint of its length. The animal appears slightly flattened dorsal-ventrally and its anus is plainly ventral.

The epithelium is brown black, thin and covered exteriorly [4] with numerous short villi. Each villus covers the point of calcareous ossicles. It is very easily to distinguish pedicels among these protuberances. The pedicels are separated into rows following nearly the entire length of the radius. These are not numerous. The dorsal radii each have two or three while the lateral radii of the trivium have seven or eight distributed the entire length of the body. The median ventral radius contains 10 pedicels that are arranged in two more or less alternative rows stopping at the posterior third of the body.

The ten tentacles are similar and as they have lateral developed ramifications, they are very similar to those of dendrochirotes.

⁴ Brutpflege bei Echinodermen (*Zool. Jahrb., Suppl.*, Bd. VII, 1904. P. 683-699.

The calcareous ossicles of the dermis (fig. 27 *a, b, c, d*) have very variable sizes. They are composed of a base with three or four arms, at the center of which is a stalk whose extremity extends in two or three divergent points. This stalk, sometimes perforated by two or three openings, is enclosed in the cutaneous villi. The arms of the base of the ossicles can be ramified and the support thus has five or six branches.

The pedicels have ossicles (fig. 28 *a, b*) identical to those of the body. But here the arms with three branches are very developed and have three free ends more or less ramified.

The five longitudinal muscle bands are simple.

The two respiratory trees are 3 mm in length. Their very large conical base has a thin transparent wall. It is extended anteriorly by a brown narrow tube. Its free end folds back on itself.

There are two bundles of long simple genital tubes. The right bundle contains two tubes while the left has six.

There is neither a calcareous ring nor tentacular vesicles.

SIMILARITIES AND DIFFERENCES. – This holothuroid belongs without doubt to the synallactids. Because of the minimal differentiation of the ventral sole, the distribution of pedicels on all the radii, the form of the [5] calcareous ossicles, and the presence of two bundles of gonads, we consider it as belonging to the genus *Synallactes*. But here the number of tentacles is only ten while it is eighteen to twenty in the *Synallactes* that have been described up to the present.

This new species of *Synallactes* cannot be near the *Mesothuria bifurcata* Hérouard reported from the “Belgica” at 71° South because the arrangement of the appendages and the form of the calcareous ossicles is completely different in these two species.

Synallactes carthagei is distinguished from *Synallactes moseleyi* Théel from the Patagonian region by the absence of adhesive feet, the longitudinal rows of the pedicels, in general simple, and by its calcareous ossicles whose bases have three branches instead of four or eight as in Théel’s species. The calcareous ossicles of our new species recall those of *Synallactes challengerii* Théel, but this latter species has nineteen tentacles, papillae on the entire dorsal surface and at least two series of pedicels on each radius of the trivium. On the other hand, the ossicles of the pedicels are slightly curved rods.

2. *Synallactes* sp. (?)

No. 845. – Biscoe Bay. Dredge, 110 m. – 1 specimen.

This specimen is nearly completely bare. Only the tentacle crown is well preserved. It is entirely extended and turned from the dorsal side. The length of this specimen is 62 mm. Its width is 20 to 25 mm.

The body wall is thin and whitish. Examination from the internal side shows on each radius two series of appendages more or less alternating with each other. There is no trace at all of calcareous ossicles.

The ten tentacles are very alike. They are short, massive and in a thick disc that has a large number of points.

There is a madreporic canal and two Polian vesicles 2 to 3 mm long.

[6] The respiratory trees are well ramified. They are unequal. One is only 10 mm long while the other reaches 30 to 40 mm

The gonads are made up of numerous ramified tubes. They show here and there great constrictions that give them a more or less moniliform appearance.

SIMILARITIES AND DIFFERENCES. – The absence of any calcareous ossicles and the bad state of this individual does not make it possible to establish without doubt its affinities. We believe it may represent a new species of *Synallactes* because the arrangement of the pedicels is not the same as in *S. moseleyi* Théel or in our *S. carthagei*. As this last species, this new *Synallactes* has only ten tentacles.

DENDROCHIROTES

CUCUMARIIDES

1. *Cucumaria Antarctica* nov. sp. (Fig. 3, 8, 26)

No. 642. –Booth-Wandel Island, beach, under stones. – 5 specimens.

No. 863. – Biscoe Bay. Dredge, 110 m. – 1 specimen.

No. 385. – Port-Charcot. Dredge, 40 m. – 1 specimen.

We group in the same species some specimens that, although collected at different depths, appear to be distinguishable only by secondary characters. Our hesitation to make this grouping has been so much the greater because certain specimens lacked calcareous ossicles or they were partially decalcified. Specimen no 385 no longer has any ossicles at all. The specimens coming from the beach have ossicles only in the invaginated parts of the anterior region of the body. Only the small individual from Biscoe Bay has very numerous ossicles in its body wall. All these individuals have a very thick flexible body wall with a brown maroon epithelium. Their ventral region is lighter than their dorsal surface. The pedicels are whitish or light maroon. They are localized on the [7] radius where they are arranged in two rows that are very close to each other. But their distribution is not the same in the different specimens. Comparison of the calcareous ossicles of the small individual with individuals of Booth-Wandel Island has led us to group them. On the other hand, the decalcified specimen, in spite of its large size, has a great resemblance to the small individual. Thus, taking the small individual as the basis for comparison, we have grouped these different individuals, but we describe separately each of the three series of specimens to indicate better their peculiarities.

The five specimens from Booth-Wandel Island are absolutely alike. They are all contracted. The tentacular crown is greatly invaginated. The rest of the body is more or less creased. The least deformed body (fig. 3) is pyriform. It has a length of 115 mm and its greatest diameter is 35 mm. Its posterior extremity is rounded while in front the body is prolonged under the form of a pentagonal prism of 37 mm of length and 15 mm of diameter.

The pedicels are localized on the radius where they are arranged alternately in two very close rows. These appendages number a hundred in each radius of the trivium although there are only eighty in each radius of the bivium. The invaginated anterior region has a length of 37 mm, i.e. equal to a third of the length of the rest of the body. There is a continuation of the radial rows of pedicels there. There are twenty in each radius.

The tentacles number ten. They are short, massive, brownish and end in short mammelated branches. They are lighter in color at the base.

In these last specimens the body wall is brownish exteriorly and whitish on the internal side. We have been able to find [8] calcareous ossicles only in the invaginated part. These ossicles are a little dispersed and they are only of a single kind. They are more or less elongated plates (fig. 8) with a very serrated contour and a surface with numerous perforations between which are arranged small tubercles with blunt ends.

In the less contracted individual, the retractor muscles are inserted 60 mm from the anterior end. The longitudinal muscles are 3 mm wide in the middle part of the body. Then they decrease towards the end.

No calcareous ring is seen at all.

The madreporic tubes, fifteen to eighteen, are short and arranged in two groups. There are three Polian vesicles. The largest, ventral, is 22 mm long while the two others on both sides of the first are only 10 to 15 mm. The gonads are formed in two bundles of simple white tube 80 mm in length. The upper tubes have a very large diameter. They have a moniliform appearance. The respiratory trees are whitish and extent nearly to the middle of the body.

The small specimen is slightly curved. Its length is 20 mm and its width is 10 mm. It is brown black with the anterior part much darker. The tentacular region is exposed and consists of ten tentacles with short peduncles and a mammelated whitish arborescence. Three of these appendages have a reduced peduncle.

The white yellow pedicels are disposed on each radius in two rows that alternate irregularly with each other. Fourteen pedicels are on the ventral median radius. On the dorsal radii they are scattered, sometimes arranged in a single series. The state of contraction of the body does not allow counting these appendages. But if they are numerous in the anterior region, there are widely spaced in the posterior region. More are found more some millimeters from the anus. This arrangement of the pedicels is the only well marked difference between this small specimen and [9] preceding specimens. The body wall also contains a single type of ossicle that are very alike. They are large elongated plates (fig. 26) with spiny edges with a large number of openings and some rare spines on their surface.

We have not found a calcareous ring. The madreporic canals are numerous.

The decalcified specimen is 110 mm in length. The body is strongly wrinkled, especially in the anterior region where the width is only 17 mm. The diameter of the posterior region of the body is more than 30 mm.

The tentacular crown is spread out but the tentacles are contracted to their peduncle.

As in the previously described specimens, the pedicels are localized on the radii. But if, in the anal region their arrangement is the same as for the specimens from Booth-Wandel Island, though their number is less, the dorsal and lateral rows in the anterior region stop at a certain distance from the tentacular crown. In spite of this difference in distribution of the pedicels, we think this specimen should be placed in this species. It is unfortunate that the complete disappearance of the calcareous ossicles of the body wall does not permit specifying these similarities.

SIMILARITIES AND DIFFERENCES. -- The very large *Cucumaria Antarctica* is very different from all the subAntarctic species already described. It belongs to the Antarctic *Cucumaria* group

having a single kind of calcareous ossicle in the body wall. From this point of view it is like *Cucumaria chiloensis* Ludwig, *tabulifera* R. Perrier, *laevigata* Verill, *steineni* Ludwig and *C. georgiana* Lamp. The calcareous ossicles of *C. chiloensis* and *C. tabulifera* are very different because they are cylinders and not perforated plates. As for *C. steineni* and *C. laevigata*, they have perforated plates with a spiny extension at one of the ends. Only the specimens of *C. georgiana* described by Lampert have [10] ossicles nearly identical to those of our species although the plates of *C. Antarctica* are larger and more perforated. But the pedicels along the trivium in *C. georgiana* are arranged in double and sometimes triple rows and are scattered on the bivium without any arrangement into rows.

2. *Cucumaria attenuata* nov. sp.
(Fig. 5 a, b; fig. 12; fig. 13; fig. 21 a, b; fig. 22.)

No. 436. – Port-Charcot. Dredge, 40 m. -- 1 specimen.

This new species is small. Its length is only 11 mm. The body (fig. 5 a, b) is more or less cylindrical, 4 mm in diameter. The posterior region is rounded. The anterior part of this single specimen is strongly inflected so that the mouth has become ventral and projects 2 to 3 mm onto the trivium. Each radius has a row of pedicels arranged in zigzag. But at certain points they seem to have two rows. These pedicels are of two sizes. In general the small ones alternate with the large ones. The ventral median radius has ten pedicels appearing arranged in two alternating rows. The lateral radius has a row of a dozen pedicels that extend nearly to the mouth. The anterior incurved region has one or two pedicels. The dorsal radius has only eighteen. For all the radii, the series of pedicels stops well before the posterior end of the body.

The body wall of this specimen preserved in formalin is yellowish white. It is thin but very rigid because of the presence of numerous slightly imbricated calcareous ossicles. These spicules (fig. 13 and 21) are only one kind. They are calcareous plates with a nearly circular contour, pierced with a large number of openings. This network has rounded tubercles here and there.

These plates can have very variable sizes. The largest (fig. 21 a, b) are slightly incurved and have a diameter of 0.2 mm; [11]. The other smaller ones (fig. 13) are only 0.2 mm in diameter and have a smaller network than the former. Plates of small size are also found in the wall of the pedicels, entire or in process of formation (fig. 12i).

The tentacular crown is very spread out. It has only seven tentacles. Five are very developed with the characteristic appearance of dendrochirotes while the two ventral ones are reduced to a simple mamelon.

The calcareous ring is formed of ten pieces, each with an anterior point that is more developed in the radials and in the interradials.

The retractor muscles are then and are inserted towards the middle of the body. The stone canal is well developed and directed forward. There is only one Polian vesicle.

The respiratory trees are localized in the posterior half of the body. They form two whitish tubes that are incurved in the anterior part and have simple branches here and there.

This specimen has not reached sexual maturity.

SIMILARITIES AND DIFFERENCES. – This new *Cucumaria* belongs to the group of Antarctic *Cucumaria* with pedicels localized on the radii but are clearly distinguished from all those presently described by the arrangement of its pedicels. In fact, there are few on each radius and

although distributed into two alternating rows they appear disposed into a single line like a true *Ocnus*. There is no accounting for the small number of tentacles of our type, which seems to be the result of an anomaly. It is very probable that the normal form has ten tentacles.

C. attenuata has some points of resemblance with *C. laevigata* Verrill. But this has in each radius a larger number of pedicels, thirty to sixty, arranged in two very clear series. On the other hand, the ventral pedicels are much more numerous than the dorsal. Moreover the calcareous plates of our species are circular and do not have spiny extensions as in *C. laevigata*.

[12] Regarding calcareous ossicles, *C. attenuata* recalls *C. georgiana* and our *C. Antarctica*. But the arrangement of the pedicels clearly separates it from them.

We refer to this species three specimens also dredged in Port Charcot but at only 20 m depth.

There exterior form is nearly identical to that of our type of *Cucumaria attenuata*. But they are much smaller. Their length is 5 mm and their diameter is 2 mm.

The pedicels are exclusively placed in the radius. In the median ventral radius, there are seven separated into two alternating rows. In the lateral-ventral radius, seven pedicels are arranged into a single row. As for the dorsal radii, they have a row of nine to ten pedicels extending very far anteriorly and posteriorly. The exterior differences with the type of *C. attenuata* are that the rows of pedicels reach completely to the posterior extremity of the body and that the mouth is surrounded by ten tentacles, of which the two ventral are very small. On the other hand, the dorsal radius has, in these latter specimens, a greater number of pedicels than our type. The white and very thin body wall contains a single type of calcareous ossicles. They are plates (fig. 22) with numerous but incompletely developed perforations. They are very similar to those of our type but they lack tubercles. Likewise we find a great resemblance between the calcareous rings of these different forms. But here the anterior extension of the interradian pieces is as developed as those of the radial pieces. None of these species have developed gonads. The slight differences that exist between these three young specimens and the type of our *Cucumaria attenuata* make us consider them at the most as simple varieties of this species.

3. *Cucumaria grandis* nov. sp.

Booth-Wandel Island, beach. – 1 specimen.

The large size of this Antarctic *Cucumaria* leads me to consider it as belonging to a new species, although the [13] characters furnished by the calcareous ossicles are completely lacking. This specimen, although contracted, still has a length of 140 mm and its greatest width is 140 mm. Its body is nearly cylindrical with a rounded posterior.

The color of the much wrinkled ventral surface is lighter than the dorsal surface. This is brownish maroon and furrowed with tracks of deeper color especially in the interradian. The dorsal radii are speckled with blackish brown dots.

On each lateral and dorsal radius are one hundred pedicels arranged in two rows alternating with each other. In the very relaxed portions of the body the distance between the two series of pedicels is 10 mm and the appendages of the same row are also 10 mm apart. As a consequence of contraction of the ventral surface it is impossible to count the pedicels of the median ventral radius but they seem more numerous than in the dorsal radii.

At the anterior end a crown of ten tentacles is extended. The mouth opens at its center. These tentacles are reduced to a short stump 15 mm long. The two ventral ones are small and are only 10 mm long. The tentacular crown has brown intertentacular lines that go up to the buccal circumference.

The body wall is thin, a little sticky and totally lacking calcareous ossicles.

In the interior of the body is a pharyngeal bulb 300 long and 30 mm in diameter, but no calcareous ring at all. The longitudinal muscles are simple and 10 mm wide. The retractor muscles have the form of flattened lamellae 2 to 3 mm wide that insert on the wall of the body 140 mm from the anterior end.

The single Polian vesicle is 120 mm long and 5 mm in diameter. The gonads are formed of two bundles of very numerous yellowish white tubes that extend the complete length of the body. The respiratory trees are well branched.

[14] A *Cucumaria* of such a great size has never been reported in the Antarctic region. It is unfortunate the ossicles are lacking because this absence prevents us from discussing its affinities. This *Cucumaria grandis* approaches our *Cucumaria Antarctica*.

4. *Cucumaria irregularis* nov. sp.

(Fig. 2 a, b)

No. 436. – Port-Charcot. Dredge, 40 m. – 1 specimen.

This very small species has its external surface covered with villi. It has thus the aspect of a *Echinocucumis*. Its body fig. 2 a, b is oval, with a rounded posterior region and a wider anterior part and terminates in well extended tentacles.

The pedicels are localized on the radius. On the trivium are eleven pedicels arranged on the median radius in two very irregularly alternating rows. Seven pedicels are distributed in a single series on each lateral radius. The bivium has only four to five pedicels on each radius.

There are ten tentacles. The two ventral ones are smallest. Each tentacle has a very developed peduncle with very long digits. They are small in number and well separated from each other.

The body wall is white, thin and has no calcareous ossicles at all.

We have not seen a calcareous ring but there is a small madreporic canal and a Polian vesicle. The retractor muscles insert completely to the anterior region of the body.

The gonads are made up of two bundles each containing 3 to 4 simple tubes.

SIMILARITIES AND DIFFERENCES. – The villi of the body, the arrangement of the pedicels and the form of the tentacles completely separate this species from other Antarctic or subAntarctic *Cucumaria*.

C. irregularis resembles in certain external characters *Synallactes carthagei* described previously. But the structure of the tentacles is very different in the two cases.

[15] In its exterior form it approaches *Cucumaria hispida* (Barrett) (*Echinocucumis typica* of Sars) of northern seas. The affinities cannot be discussed because of the dissolution of the calcareous ossicles.

5. *Cucumaria lateralis* nov. sp.

(Fig. 23, 24 and 25)

No. 120. – Port-Charcot; Booth-Wandel Island. Dredge, 20 m. – 1 specimen.

No. 865. – Biscoe Bay. Dredge, 110 m. – 1 specimen.

We combine under the same name two specimens that externally have a certain number of common characters but whose identity remains uncertain because calcareous ossicles are completely lacking in one. This decalcified specimen is in good condition and came from a dredge at 110 m. The other that we use to establish the diagnosis of the new species is greatly contracted and was collected at 20 m depth.

The contracted individual is ovoid, 50 mm long and 38 mm at its greatest diameter. The body walls are thin and grayish white. The pedicels are 1 mm in diameter. They are greatly projecting and very clear. Their distribution on the dorsal surface is different from that on the ventral surface. On the trivium, the pedicels are localized on the radius, following the median radius. They are arranged in two rows the entire length of the body and from place to place there is a third series. Likewise two rows of pedicels extend the entire length of the lateral radii but, in the middle part of the body they add one or two new rows. At first glance the pedicels appear irregularly distributed on the entire dorsal surface as well on the radius as on the interradius. However an attentive examination shows that the appendages are aligned to the radius where they form two principal rows extending the entire length of the body bordered on both sides with two to three lateral rows that are spread out more or less on the interradius. The pedicels arranged on the interradii are similar to those of the radius.

The calcareous ossicles are distributed in the body wall. They are plates with tubercles. Some (fig. 23) have a small [16] number of openings, approximately five to six, similar to those of *Cucumaria georgiana* Lamp., while others (fig. 24) are four times larger than the preceding and have thirty perforations.

The plates in the pedicels (fig. 25) are elongated and have a small number of perforations and tubercles.

The retractor muscles are inserted towards the middle of the body.

The calcareous ring is formed of ten strong pieces. Each has a median anterior projection.

The single Polian vesicle is 20 mm long. There is only a single madreporic canal to the left of the dorsal mesentery.

The gonads are formed of two bundles of numerous simple tubes. In addition, two incubation pouches filled with segmented eggs are located anteriorly on either side of the longitudinal muscle of the right latero-dorsal radius. Each of the pouches opens to the exterior by a pore located nearly at the anterior end of the body.

The second individual, very relaxed, is 40 mm long. Its body is oval and the posterior ends in a point. The body wall is very thin and its transparency allows the gonads to be seen.

There are ten tentacles. The two ventral ones are smaller. A genital papilla projects into the tentacular circle between the two dorsal tentacles.

As in the preceding specimen, the pedicels are localized on the radius of the ventral surface while on the dorsal side they are distributed on the radius and the interradius. There are sixty six pedicels on the ventral median radius. They are arranged in two rows alternating with each other in places. There are seventy in the lateral-ventral radius arranged in two or three rows. The dorsal radii have five to six rows of pedicels in the middle region. Those farthest from the midline of the

radius do not reach the end of the body so that there are three rows of pedicels anteriorly and two posteriorly.

[17] In this specimen the retractor muscles insert at the posterior quarter of the body. As for the other internal organs, they are the same as those in the specimen described in the first place.

The calcareous ring is formed of ten pieces that have an anterior median protrusion. Those of the radials are more massive than those of the interradians. The single Polian vesicle is 8 mm long. There is only one madreporic canal directed anteriorly. The respiratory trees have whitish branched tubes. The gonads are formed of two bundles with twenty simple whitish tubes.

SIMILARITIES AND DIFFERENCES. – The presence of a single kind of calcareous ossicle in the body wall brings *Cucumaria lateralis* near *C. georgiana*. But if the stages of development of the ossicles of our new species are like those of *C. georgiana*, the largest definitive plates with their numerous perforations make it possible to distinguish it very clearly from the species of Lambert.

The distribution of the pedicels cannot be here a very important specific character to invoke because in the types of *C. georgiana* these appendages are arranged in a double row on the radius of the trivium while they are irregularly on the radius and interradius of the bivium. While in those specimens Lambert had separated under the name of *C. pithacnion* and that Ludwig attached with good reason to *C. georgiana*, the pedicels are in two rows on all the radii. In *C. lateralis* the distribution of the pedicels on the latero-ventral radius is completely different than that in *C. georgiana*. Moreover, the pedicels in this new species have plates with tubercles while only the specimens originally referred to *C. pithacnion* have numerous plates in the pedicles similar to those of the body wall but lacking tubercles.

In the numerous specimens of *C. georgiana* observed by Lampert, and whose size varied from 0.6 to 7 cm, these author no incubatory pouch at all. The arrangement of the pair of incubatory pouches on the right dorsal radius is now very special to our new species.

[18]

6. *Cucumaria turqueti* nov. sp.

(Fig. 1)

No. 382. – Port Charcot. Dredge, 40 m. – 1 specimen.

The body of this new *Cucumaria* is ovoid, slightly tapered at the two ends. In this contracted specimen the length is 85 mm and the greatest diameter is 40 mm. The dorsal surface is deep maroon in color while the ventral surface has a lighter tint.

The white pedicels are exclusively located on the radius. At first appearance, they appear arranged on each of these in two very clear rows the length of the body and located a certain distance from each other: 3 mm for the radii of the trivium and 5 mm for those of the bivium. A more careful examination shows near very large pedicels reaching 2.5 mm in length small pedicels that are very short and often reduced to a slight mamelon. In general the small pedicels are intercalated between the large ones and nearer than those of the axis of the radius so that each ambulacral row is a zigzag. In certain places it appears to be made up of two rows of appendages of different size and alternating with each other.

The pedicels are more numerous on the trivium than on the bivium. Each ventral radius has one hundred to one hundred and seven of them while the dorsal radii have only approximately sixty eight.

The body wall is thin. In the opened preparation it shows only small characteristic masses resulting from the attack by the reagents on the calcareous ossicles and which, according to their arrangement, indicate that the ossicles were very spread out in the body wall. But it was impossible to find a single calcareous ossicle.

The acidic attack must have been prolonged because we found no calcareous ring at all.

The longitudinal muscles are simple and 3 mm wide. The very thin retractor muscles are inserted 30 mm from the anterior end. The invaginated pharynx is 15 mm in length, [19] The water ring has a ventral Polian vesicle 200 in length and dorsally a madreporic canal inflected forward. The stomach is much differentiated.

The gonads are formed of two bundles of simple whitish tubes 20 to 30 mm in length and arranged

The very developed respiratory trees have a thin transparent wall.

SIMILARITIES AND DIFFERENCES. – The complete disappearance of the calcareous ossicles after action of the preserving agents does not allow giving all the characteristics of this species but we believe it to be new.

The color of the body wall and the arrangement of the pedicels connect *Cucumaria turqueti* to *Cucumaria crocea* Lesson. It differs essentially because, in our new species, the pedicels of the dorsal surface are as developed as those of the ventral region and that there is much less ambulacra in each dorsal radius than in the ventral radius. In *C. crocea* to the contrary, the dorsal appendages are less projecting, being very much smaller than those of the ventral surface and, besides, they are more numerous than the ventrals. Moreover in *C. crocea* we do not find in each radius this alternation of pedicels of large and small size that we have reported in *C. turqueti*. From the point of view of internal organization, there is in a much differentiated stomach in these two species but the arrangement of the gonads is very different.

7. *Cucumaria* sp. (?)

No. 269. – Port Charcot. Dredge, 40 m. – 1 specimen.

It is impossible after the action of formaldehyde and the acids to precisely determine this *Cucumaria* because the calcareous ossicles have completely disappeared.

The strongly contracted animal is cylindrical but it is slightly pentagonal in the very contracted regions. Its length is 45 mm [20] and its diameter is 15 mm. The middle region of the body is greatly wrinkled while the terminal regions are still swollen and appear covered with small verrucosities. The mouth opens at the end in a small terminal mamelon. The anus is deflected to the side.

The pedicels are entirely localized in the radii. There are forty in each radius arranged in two alternating rows. There are ten tentacles. The two smaller are smaller.

The epithelium is whitish. The body wall is very thin and completely lacks calcareous ossicles.

The calcareous ring is formed of ten pieces. Each has an anterior projection in the middle. This is larger in the radial pieces than in the interradials.

The retractor muscles insert towards the middle of the body. The length of the single Polian vesicle is 15 mm. There are three madreporic canals. They are very short and each ends in a very distinct madreporite. The gonads are made up of two bundles of simple tubes placed at the end of a very long genital canal.

SIMILARITIES AND DIFFERENCES. – We have compared this specimen to the species of Antarctic *Cucumaria* that have like it pedicels localized in the radii. These species are *C. steineni* Ludwig, *C. laevigata* Verrill, *C. leonina* Semper and *C. tabulifera* R. Perrier. They are all very rich in calcareous ossicles had have no anatomical peculiarities from our specimen. This specimen should be compared to *C. chiloensis* Ludwig that also has a pentagonal contour and a double row of pedicels in each radius. But our specimen is pentagonal only in the strongly contracted region, In addition all its interradii are identical while in *C. chiloensis* the two interradii of the trivium are smaller than those of the bivium. Only the comparison of the calcareous ossicles could allow discussion of these affinities but unfortunately they have been completely dissolved in our specimen.

[21]

8. *Psolus Antarcticus Philipi*

No. 801. – Biscoe Bay. Dredge, 110 m. – 1 specimen.

This single specimen has all the characteristics of the *Psolus Antarcticus* type. It is 22 mm long and 17 mm wide. R. Perrier has emphasized the fact that the *Psolus Antarcticus* presently described are of adults of two very different sizes. The larger is at least 38 x 28 mm and the smaller is at most 16 x 12 mm. Now the specimen collected by the “Français” has intermediate dimensions than those of these two series of forms. It makes it possible thus to affirm that these individuals of such different sizes certainly belong to the same species.

8. *Psolus charcoti* nov. sp.

(Fig. 6 a, b.)

No. 861. – Biscoe Bay. Dredge, 110 m. – 1 specimen.

The body of this new *Psolus* is more or less cylindrical but with ends that are truncated cones. The anterior region is more truncated than the posterior. The latter is raised dorsally and its end is nearly a point. This specimen is 50 mm long and its greatest diameter is 14 to 15 mm. Its color is uniformly grayish but the anal and buccal ends are whitish.

The body wall is thin. Its surface is divided and grooved by a very irregular reticulation. No region shows calcareous plates imbricated on each other and visible externally

The ventral sole, although very distinct, has the same color and even the same structure as the rest of the body. It is not surrounded by a lateral border and does not extend the entire length of the trivium. Its form is that of a trapezoid 33 mm long with the wider base 10 mm from the mouth, is 10 mm. Its smaller base 5 mm before the anus, is 6 mm.

[22] In each radius of the ventral sole is a single row of pedicels. Those of each lateral radius, fourteen to sixteen in number, are uniformly distributed the entire length of the sole whe

nine pedicels of the median radius are arranged in groups of three at the ends and the central region of this radius.

The calcareous ossicles of the body wall and the sole are absolutely the same and are more or less circular reticulated plates. The diameter can be up to 0.70 mm. Their surface often has two or three networks superposed of anastomosing ribs especially on the central region of the plate.

The calcareous ring has ten pieces. The radials are extended forward by a very strong point that is shorter in the interradials.

The retractor muscles insert 20 mm from the anterior end. The tentacles re entirely contracted into a pharynx 9 mm long and 6 mm in diameter. There is a long madreporic canal and a single Polian vesicle 6 mm long.

The gonads are made up of two bundles of 20 whitish tubes.

The respiratory trees are whitish tubes.

SIMILARITIES AND DIFFERENCES. -- *Psolus charcoti* is close to *P. murrayi* Théel because it has a sole that takes up only part of the ventral surface and a nearly identical arrangement of its pedicels. But it is clearly distinguished by the perfect continuity of the lateral walls of the body and the sole. In *P. murrayi*, according to the figure of Théel, the sole is circumscribed by a lateral border. In addition the calcareous ossicles are much different in the two species. *P. charcoti* has no cup at all.

[23]

10. ***Psolus granulosus*** nov. sp.

(Fig. 4 *a, b*; fig 9. *A, b, c*; fig. 10, fig. 11 *a, b*; fig. 18.)

No. 545. – Booth-Wandel Island, beach. – 17 specimens.

No. 528. – 1 specimen

No. 666. – 1 –

No. 694 – 1 –

The numerous specimens of this new *Psolus* were red but under the influence of the reagents are now nearly colorless. Only the internal organs have kept their original color. The preserving liquid has taken a reddish tint.

The specimens are of very different sizes. Their length ranges from 7 to 22 mm, their width from 4 to 10 mm, and their height from 2 to 7 mm.

The more or less strong state of contraction of the different individuals gives them very varied aspects. However they all have a strongly convex nearly cylindrical dorsal region with a granular surface and a flat ventral sole made up of a thin smooth membrane. This sole is limited on all its edges by a very clear border. It is sometimes inflected on the ventral side. The back is raised in some specimens, sometimes towards the anus, sometimes towards the mouth. These two openings are dorsal in most individuals. But in a very relaxed specimen (fig. 4 *a, b*) the mouth is obviously terminal while the anus is dorsal.

The granulations that cover the dorsal surface of the body are more visible around the mouth and anus where they are arranged in concentric circles. In no case have we seen peribuccal and perianal plates.

The pedicels are localized on the edge of the ventral sole (fig. 4, *a*). They are arranged in two rows the length of the lateral radii. The internal row is made up of thirty pedicels. They are

always quite visible and are mainly large ones with smaller ones intercalated among them. The completely marginal row is more or less hidden by the inflected lateral border. The pedicels that make it up have a diameter two times smaller [24] than the internal appendages. In front and behind, the two series of ambulacra are inflected and thus border the entire periphery of the sole. At the two ends of the ventral median row are some pedicels arranged in two rows. There are never more than two or three pairs. Often there are only two or three of these appendages at each end.

There are ten tentacles. The two ventral are smaller and have only short branches.

The dorsal body wall contains calcareous ossicles of two kinds:

1° Irregularly rounded perforated plates formed from the superposition of a double and in certain places a triple network of anastomosing branches and having a large number of small openings. Their diameter can be 0.20 mm.

2° Latticed cups (fig. 10, fig. 11 *a, b*) whose more or less raised borders are united by an anastomosing network. These are the cups that, when underlying the external integument, give the granular aspect of the dorsal surface.

The thin membrane of the sole contains perforated plates (fig. 8). They are more or less oval and a little convex. On their surface are at some points small spherical tubercles.

The pedicels contain perforated plates. They are elongated with irregular contours (fig. 9 *a, b, c*).

The calcareous ring is formed of ten identical arches.

There are two Polian vesicles arranged in a symmetrical fashion in relation to a median plane.

The gonads are made up of two bundles of two to three simple tubes.

On the ventral surface of some species are numerous eggs embedded in the wall of the sole.

These eggs are in different states of development, being embedded in verrucosities from which they are easily removed. In certain *Psolus* we have even observed young larvae 2 mm in length fixed to their sole.

[25] SIMILARITIES AND DIFFERENCES. – This incubation of eggs and young larvae has led us to compare *Psolus granulosus* to *Psolus Antarcticus Philippi* that does the same thing. These two forms can be easily distinguished from each other. *P. Antarcticus* has in fact perioral and perioanal triangular plates regularly arranged in a circle and its dorsal surface is covered with imbricated plates. The calcareous ossicles are very different in the two forms of *Psolus*.

Psolus granulosus has some similarities with *P. belgicae* Hérouard collected by the “Belgica”. But in our new species the mouth is terminal and there are no very obvious plates having an imbrication that seems to leave from two centers placed symmetrically on the lateral sides of the body. Moreover Hérouard has had the kindness to compare our species with his *P. belgicae* and he has no doubt these are two different species.

P. belgicae, which is only 7 mm in length, cannot be the young form of *P. granulosus* because our specimens 7 mm in length already have adult characters and are distinguished very clearly from *P. belgicae*.

Psolus granulosus thus appears to be a new form of incubating holothuroid of polar regions.

CONCLUSIONS.

The holothuroids collected by the “Français” belong completely to the obviously Antarctic fauna because they have been collected between 64° and 66° south latitude. We consider with Koehler as clearly Antarctic the region south of 55° south latitude and as sub-Antarctic the part between 50° and 55°.

According to this definition the other presently known collection of Antarctic holothuroids is that of the “Belgica”. Comparison of the holothuroids of the “Français” with those of the “Belgica” shows there is no species at all in common. This difference which is so marked leads us to admit that documentation of Antarctic holothuroids [26] is still very incomplete and that there are perhaps in these waters certain localities with fauna identical to those that have been observed elsewhere.

The “Belgica” reported from obviously Antarctic regions representatives of all holothuroid groups: a new synallactid (*Mesothuria bifurcata*), a new *Psolus* (*Psolus belgicae*), *Trochostoma Antarcticum* Théel, *Chirodota studei* Théel and two new elpiids (*Rhipidothuria racovitzai* and *Peniagone vignoni*) as well as numerous elasipod larvae. The *Cucumaria* reported by Hérourard belong to the sub-Antarctic region because they were collected at Port Torro (Navarin Island).

The collections of the “Français” have no elpiid, molpadiid and synaptid at all, but only synallactids and cucumariids. The latter is preponderant because they make up at least six new species of which only one *Psolus granulosus* has some resemblance with a species of the “Belgica”: *Psolus belgicae*.

This preponderance of cucumariids is found again in the collections from sub-Antarctic regions (Strait of Magellan, Cape Horn) where the genus *Cucumaria* contains numerous species while the other holothuroid orders are very small in number. The Holothuridae, for example, are represented by only three species.

According to the works of Ludwig and Koehler comparing arctic and subarctic with Antarctic and sub-Antarctic regions, there are no bipolar echinoderm bipolar species at all. The holothuroids reported by the “Français” also has no bipolar form at all. After the numerous accumulated facts against bipolarity, it seems definitively established that the Antarctic fauna is different from the arctic fauna. I would not have believed it necessary to take up this question again, especially from documents of such little importance, if R. Perrier⁵ had not just reported among the holothuroids *Psolus squamatus* Düben and Koren as a species common to both polar zones. This identity is not at all perfect because the author, according to Théel, states that the antarctic *Psolus squamatus* is a variety of the arctic type that he designates by the name *segregatus* (Ludwig had not agreed to the identification of Théel).

It is thus interesting to examine again these two polar forms.

Thanks to the kindness of Joubin, who has sent me undoubted specimens from Cape Horn determined by R. Perrier, I have been able to form an opinion on this subject. In comparing these Antarctic *Psolus* with the specimens of *P. squamatus* from arctic seas from the collection of Koehler, I acknowledge in fact that there exists a very great external resemblance between these two arctic and Antarctic forms. However, as R. Perrier has already reported, the arrangement of the peribuccal plates is more regular in the Antarctic form than in the arctic form. Moreover, the extensions of the interradian pieces of the calcareous ring are more robust in *segregatus* than in *squamatus*. But the most marked differences are shown in the calcareous ossicles of the sole and pedicels. In spite of their great variability, there is no resemblance at all between the calcareous ossicles of the sole of these two forms. In *P. segregatus* these ossicles (fig. 14, 20) are like those

⁵ Holothuries antarctiques du Muséum d'histoire naturelle de Paris (*Ann. Des Sc. Nat., Zool.*, 9° série, t. I, p. 1-146). We refer to this memoir for the bibliography of Antarctic holothuroids and the question of bipolarity.

of the ventral pedicels (fig. 15, 19 *a, b*). They are elongated plates with irregular contours and pierced with a certain number of openings. One sees some small pearl-like tubercles on their surface. In *P. squamatus*, although the ossicles of the pedicels (fig. 16 *a, b, c*) resemble those of *segregatus*, those of the sole (fig. 17 *a, b, c*) are very different in dimension and structure. They take the form of an *x* whose bifurcated and anastomosing branches circumscribe two to four large openings. These differences appear to us sufficient to raise the variety of R. Perrier to the rank of a species distinct from *P. squamatus* Düben and Koren and that we designate under the name *P. segregatus* R. Perrier. While agreeing with R. Perrier that “the fact of considering these two forms as two [28] varieties of the same species or two related species is a matter of opinion or personal preference, we call attention to the differential characters that do not permit this author to completely identify the Antarctic form with the arctic form. We have added other characters furnished especially by the calcareous ossicles that we have added to separate them as distinct species, confirming thus the opinion of Ludwig. The identification of these two species, *P. squamatus* and *P. segregatus* is thus no longer possible and consequently, there can no longer be a question of *P. squamatus* as a bipolar form. Thus the single example of bipolarity furnished by echinoderms disappears.

If, with most authors, we do not accept bipolarity, we are struck by the analogies presented by certain arctic and Antarctic species. Arctic *Psolus squamatus* resembles Antarctic *P. segregatus*, *Cucumaria glacialis* Ljungmann resembles our new *C. attenuate*, *Cucumaia hispida* (Barrett) resembles *C. irregularis*. E. Perrier has prepared lists of analogous similarities between the species of asteroids of the two poles. These external resemblances are one of the reasons that have led certain zoologists to recognize bipolarity but most biopolar species have not held up to detailed examination.

PLATE LEGENDS

PLATE I

- Fig. 1. – *Cucumaria turqueti* nov. sp. Reduced ca. = 3/4.
Fig. 2a. – *Cucumaria irregularis* nov. sp.; dorsal surface. Mag. = 4.
Fig. 2b. -- -- -- ; ventral surface. Mag. = 4.
Fig. 3. -- *Cucumaria Antarctica* nov. sp. Reduced = 2/3.
Fig. 4a. -- *Psolus granulosus* nov. sp.; ventral surface. Mag. = 2.
Fig. 4b. -- -- -- ; lateral view. Mag. = 2.
Fig. 5a. -- *Cucumaria attenuata* nov. sp.; lateral view. Mag. = 4.
Fig. 5b. -- -- -- ; ventral surface. Mag. = 4.
Fig. 6a. -- *Cucumaria charcoti* nov. sp.; ventral surface. Mag. = 1.
Fig. 6b. -- -- -- ; lateral view. Mag. = 1.
Fig. 7a -- *Synallactes carthagei* nov. sp.; ventral surface. Mag. = 7/2.
Fig. 7b. -- -- -- ; dorsal surface. Mag. = 7/2.
Fig. 8. – *Cucumaria Antarctica* nov. sp.; perforated plate from the invaginated region of the body. Mag. = 220.
Fig. 9 a, b, c. – *Psolus granulosus* nov. sp.; perforated plates from the pedicels. Mag. = 220.
Fig. 10. – *Psolus granulosus* nov. sp.; cup from the dorsal body wall seen laterally. Mag. = 366.
Fig. 11 a, b. *Psolus granulosus* nov. sp.' cup from the dorsal body wall seen in plane and in profile. Mag. = 366.
Fig. 12. – *Cucumaria attenuata* nov. sp.; calcareous ossicle. Mag. = 333.
Fig. 13. -- -- -- ; small perforated plate of the body wall. Mag. = 220.
Fig. 14. – *Psolus segregatus* R. Perrier; perforated plate from the ventral sole. Mag. = 220.
Fig. 15. -- -- R. Perrier; perforated plate from the pedicels. Mag. = 220.

PLATE II

- Fig. 16 a, b, c. – *Psolus squamatus* Düben and Koren; perforated plates from pedicels. Mag. = 220.
Fig. 17 a, b, c. -- -- -- calcareous ossicles from the ventral sole. Mag. = 220.
Fig. 18. – *Psolus granulosus* nov. sp.; perforated plate from the ventral sole. Mag. = 220.
Fig. 19 a, b. – *Psolus segregatus* R. Perrier; perforated plates from the pedicels. Mag. = 220.
Fig. 20. -- -- -- perforated plates from the ventral sole. Mag. = 220.
Fig. 21 a, b. – *Cucumaria attenuata* nov. sp.; large perforated plates from the body wall. Mag. = 200.
Fig. 22. – *Cucumaria attenuata*. Small example; perforated plate of the body wall. Mag. = 220.
Fig. 23. – *Cucumaria lateralis* nov. sp.; small perforated plate from the body wall. Mag. = 220.
Fig. 24. – *Cucumaria lateralis* nov. sp.; large perforated plate from the body wall. Mag. = 220.
Fig. 25. – *Cucumaria lateralis* nov. sp.; perforated plate from the pedicels. Mag. = 220.
Fig. 26. – *Cucumaria Antarctica* nov. sp.; perforated plate from a small individual. Mag. = 333.
Fig. 27 a, b, c, d. – *Synallactes carthagei* nov. sp.; calcareous ossicles from the body wall. Mag. = 90.
Fig. 28 a, b. – *Synallactes carthagei* nov. sp.; calcareous ossicles from the pedicels. Mag. = 220.

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Imp. Monrocoq. Paris.

Holothuries.

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