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Contribution to the knowledge of the
species of the genus Cyamus Latr., or whale lice

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Contribution to the Knowledge of the Species
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By C.F. Lütken.

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At the eighth session of Scandinavian naturalists in Copenhagen, July 1860, I had the honour to show Scandinavian Cyamus species to the Zoological "tion. These species were kept at the University's Old Zoological Museum. I had also the honour to add the following comments, which I permit myself to reprint here from the printed report of my paper read to the assembly:

"After the report of professor Krøyer concerning Cyamus ceti" in the Fourth Volume of the "Naturhistorisk Tidsskrift" /Journal for Natural History/, it was generally accepted, that in Scandinavian Seas lived only one Cyamus-species, and its habitat was the long-flipped humpback whale (Balaenoptera longimana or boops)-the Kerorkak. But already Martens says explicitly, that a whale louse lives upon the "whale fish", i.e. upon the Balaena mysticetus. Furthermore, he knows nothing about any lice on the humpback whales, which he does not call

"whale fishes" at all, but "Fin fishes". In the "Zoologia Danica", plate 119 a very distinct Cyamus-species, is represented, which very correctly is indicated to be living on the narwhal.

Among Scandinavian species were shown:

1. The species living on the Balaena mysticetus. Mr. Olrik, King's Counselor, has sent several specimens with precise information, that they were taken from the above-mentioned whale; it should be preferred perhaps, to let it keep the name Cyamus ceti Lin.
2. The species living on Keporkak; the fact that it is taken from this species of whale is known also from a direct information given by the sender, Mr. Olrik, K.C.
3. The species living on narwhal, the one represented in the "Zoologia Danica", as - C. nodosus Ltk. A piece of skin from around the narwhal's large tusk, which can be seen in the University's Zoological Museum, indicates that it is located exactly at that point; but whether it appears on other parts of the animal, whether it is limited to the males only, we still do not know. That it had been reported to the Museum by another zoologist under the name of C. Belugae, - what might indicate that it had been taken from a beluga, - could perhaps be explained by a common misunderstanding of the name "Whitefish", which in Greenland is used both to indicate the narwhal, and the beluga. It was sent to the Museum by three different collectors (Olrik, Rink, and Fleischer with definite information

that it originated from a narwhal, but no definite datum was known to the informer, that this species also occurred on the true "Whitofish".

4. Another species, which probably also lives on the narwhal, the latter being close to the species living on the *Balaena mysticetus*, but which is smaller, and also different in other features. It appears with some certainty, that this species occurs on narwhal, because it constituted a considerable portion of the specimen mixture with C. nodosus sent by Mr. Fleischer and which expressly stated by the latter, to have originated from a narwhal, also, as it was repeatedly found among individuals of this species, whose origin was not established through any definite information. However, we still do not know, whether it possibly lives on a different part of the body, than the C. nodosus, or whether it occurs in combination with the latter. /r.l./

5. A species living on the pilot whale, takes its abode in the immediate vicinity of the teeth, as it may be seen from a skin portion exhibited at the University's Zoological Museum.

6. A species living on the bottlenose whale; this species is characterised by its flatness and by its first pair of legs being as developed, as the second pair; of this reason it might be permissible to set up a separate genus for this species. *)

*) The author does not want to mention names here, used at the University's Zoological Museum, in order not to cause any confusion, in case that this species will be described by others, before this work on this genus will be published.

"On the basis of the above experience, the author accepts the viewpoint that each Cyamus-species probably lives only on one definite whale species each, and that these parasites in certain cases may present a workable auxilliary feature for the distinction of the species of the Cetaceans."

This considerable work is referred to in the above quotation. Its publication took so long because of the following reasons, - some scientific, namely, that I wanted to come to a greater clarity concerning the problem in question through material sent from our Scandinavian neighbours, and also to wait for information on the subject, which might appear elsewhere in literature; other reasons were of personal character, but, nevertheless, very important to me, such as the work connected with the institution and equipment of the new museum; these matters made it impossible for me to return to the above subject and to give it finishing touches. Growing interest in Cetology, however, which characterizes the latest decades, has more than once reminded me that the Science is entitled to expect from me information on the results of my studies, when they had reached any final form and I had the required time for their publication. I shall later return to the discussion of some difficulties connected with this study; here I shall only mention that to illustrate the species, I had to be satisfied with contour-drawings done by myself, they have, probably, their faults, but still, I hope, have sufficient accuracy to give an understanding of the Physiology and the character

of the species. I must point out, that I did not intend to give a complete monograph on the Cyamus-genus, but merely a contribution to the knowledge of the distinction and appearance of the species; some of my work's possible faults might find their excuse in the unfavourable conditions under which the work was done, and because of frequent interruptions, I had to suffer. That the /p.232/ work has gained something by being kept longer than "nonum in annum", appears from a comparison with the above-printed temporary extract, from which we see, that now I am able to speak with greater certainty about much, which at that time I could only present as more or less certain assumption. Thus, if I will succeed in bringing the subject one step further, and perhaps give it a push, which may call forth contributions from other sides, where they were kept back until now, then nothing will make me happier, if this little section of Zoology through efforts of others, will soon reach such a development, compared to which my work will merely be remembered as a by-gone stage. But before I will return to my main task, a few orientating remarks on the historical d of our knowledge on this group of Crustaceans, that we call the "whale lice" should be proper, the more so, since an exhaustive account of this group is nowhere available, and without such an account it will be difficult to understand the context with certain confusions, which seem to keep on re-appearing even in recent times. This kind of historical studies are equally boring to be made, prepared, and read, but at times they are indispensable.

Fr. Martens (1675)^{a)} is the first to mention and describe one of these animals. As it is called "Walfisches Lausz" /whale louse/ and furthermore is discussed under the chapter "Walfisch" /whales/, by which Martens only means the rightwhale and preferably the northern whale, *Balaena mysticetus* (a special section deals with the "fin fishes", in which nothing is said about similar parasites), there is no doubt, that M. speaks about a Cyamus from *Balaena mysticetus*. The picture is very poor indeed, but the description in most passages is correct, and at least of such a quality, that there was no need of confusing it with the Pycnogonids and similar animals. He also gives certain biological data, for example, that they attach themselves to certain points of the whale (between flippers and on genitalia), and that they bite out entire portions of the skin, giving an appearance to the skin, as if birds were picking at it.

It is obvious that the parasites of *Balaena mysticetus* fell easiest in the hands of the ancient naturalists, the great upswing in the whaling. Therefore, one may, as a rule, assume that this species was the basis for all descriptions far into

a) "Spitzbergische oder Grönländische Reisebeschreibung", page 85 - 87, t.C.f.D. (reprinted in the 1741 edition of H. Egede's "Det gamle Grønlands nye Perluustration eller natürel Historie"/The old Greenland's new perlustration or Natural History/. Plates to page 34, and in Adelung's "Geschichte d.Schiffarthen").

the present century, since there are no particular reason to believe the contrary.

Our next author is Albert Seba (1734); his pictures of "Pediculi Ceti"^{*)} are much worse than most of the other pictures in his famous work, but they still could with reasonable accuracy be recognized as the same species (*Balaena mysticetus*); from the text we learn^{**)} nothing but a fable . /p.6/.

Here, just as in so many other cases, Linné had to take his knowledge from books alone; at "Museum Adolphi Frederici regis" (1754, fol.)^{***)} specimens were available for his study. Under "Oniscus ceti"

*) Locupleyissimi rerum naturalium thesauri. Vol. I, page 142, Plate 90, figure 5 (E,F, - a male seen from above and from below, G - a female, H - a young male).

**) Namely, that according to the sayings of the sailors, they creep into the whale's ears, "hasque morsu perforant."

***) Page 89. "Oniscus ovalis, segmentis excepto secundo in medio interruptis (with broken joints) Caput parvum." "Antennae 2, singulae articulis 4; corpus ovale, magnitudine Ricini, sectum segmentis 7, interruptis in medio, excepto solo secundo. Pedes paribus 7, quorum 1 minutum sub capite, 2 crassius ovatum, 3 & 4 mutica, 5, 6, 7 ovata, uncinata."

a diagnosis and a brief description are given;
 Seba's picture is quoted. If one single point in
 the description is excluded, being unclear ^{x)}, then
 there is nothing in the description, which indicates
 any definite species, neither is there anything, which
 could exclude the possibility, that this could be the one
 living on Balaena mysticetus. Since it is hardly possible
 to gain certainty on this point, it would be probably correct
 to drop the special-name "ceti" completely; especially
 since later authors had used this name for at least
 four different species. "Oniscus ceti" still occurs in
 "Systema Naturae" (1758) (Vol. I, page 636) with the same
 diagnosis; besides "Mus. Ad. Frid." and Seba, Martens
 quotes it quite accurately. Martens is the only author
 stated in "Fauna Suecica" (1761, second edition) ^{xx)}.
 The diagnosis here is changed and improved; on the other
 hand a confusing error had crept in the XII edition of the

 x) The immediately above-emphasized words.

xx) Page 499, N^o. 2056. "Oniscus ceti ovalis, segmen-
 tis distinctis, pedibus tertii quartique paris lib. acribus,
 muticis". "Corpus ovale, 7 articulis distinctis. Caput
 quod primus articulus minimus. Pedes 1, 2, 5, 6, 7 che-
 lis crassis ungue mobili acuto terminati. Pedes vero 3, 4
 paris filiformes, mutici primum par sub corpore est.
 Corporis articuli magis remoti & distincti quam in reliquis
 speciebus." Cfr. page 208 (Phalangium balaenarum).

"Systemet" (1767) (Volume I, page 2, page 1060), and left traces there right to the most recent time. The diagnosis is actually the same as in 1761 (with a small change, which probably is merely a misprint or a slip of the pen) ^{*)} but the quotation of Martens is left out, and an admonition not to confuse it with "Phalangium Balaenarum" (i.e. Pycnogonum of Brunnich) is added. We see now that Marten's "Whalefish Louse" is added as a synonym to the latter. Furthermore Linné was led astray by Baster, who in his meantime (1765) published "Opuscula subcesiva" ^{**)} gave a description and drawing of a sea-spider (Pycnogonum littorale) believing, that this was the "whalefish louse" described by Martens, although it did not escape him, that the form in question differed in very material features both from Martens' representation of "whalefish louse", and from Linné's genus-characteristics for Oniscus.

Surely Pallas (1772) ^{***)} maintained again the correct form and changed Linné's reference to the Marten's form to "Acarus polygonopus" (Pycnogonum); but the confusion was already let loose, and not to be extinguished for many years. Pallas' description is basically /p.235/.

*) "Ovaticis" for "muticis"; corrected by deGeer and Gmelin, but nevertheless repeated by subsequent authors, for example, in "Handbuch d. Naturgeschichte" by Blumenbach.

**) Volume II, book 3, page 139, plate XII, fig. III A-D.

***). Specilegin Zoologica, quibus novae imprimis et obscurae animalium species iconibus descriptionibus atque commentariis illustrantur, fasc. 9nus, p. 76-78, tab. 4f 14, A-C.

accurate, but his drawings are far from perfect; it is probable, that he too, was confronted with parasites of the bowhead whale. He is the first, who points out the difference in the genitalia (egg-plates), the difference between the old and the juveniles in the brooding sac, the considerable similarity between these parasites and the Caprellae ("Oniscus scolopendroides") /which he, however, exaggerates somewhat/, and, in general, the close connection between these parasites and the whale lice, of the reason he also maintains that the capellae should be placed in the Oniscus genus.

DeGeer too (1778)^{*)}, who calls the whale louse "Squilla Balaeni", was probably studying the above-mentioned parasites of the bowhead whale. The description is exhaustive and basically correct, the pictures are better than the ones of his predecessors. Neither Gmelin (1788)^{**)}, nor Otto Fabricius (1780)^{***)} made any confusion of whale lice or of information concerning them, with Pygogonum (littorale); the latter-named author,

*) Mémoires pour servir à l'histoire des Insectes, t.VII. p. 540-44, t.42 f.6-10 (A male, 16 millimeters in length). "Squilla (Balaeni) corpore ovali depresso, segmentis distinctis, pedibus cheliferis, tertii quartique papis linearibus muticis". - By "Squilla" deGeer understood "wingless insects with 14 legs, the two front ones "à tenailles simples", 4 setae- or filament-forming antennae and ordinarily having thin plates under the tail." His other "Squilla" -species are Asellus acusticus, Idothea entomon and emarginata, Gammarus rufex, and Squilla mantis.

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however, does not describe them himself, but refers to the description of Pallas. His remark, "my specimens were taken from Balaena boops", did not (although there was good cause for this) raise any assumption, that the species studied by him was different from the one studied by Seba, Pallas, deGreer, and others, but, probably later, this initiated another error: namely, the statement that the "Scandinavian whale louse" only occurred on Balaenoptera (Megaptera) boops.

The drawing of "Oniscus ceti" by Abildgaard in the Third Volume of "Zoologia Danica" (1789) is of particular interest, because the specimens used came from a third species of whale, - namely, the narwhal. ^{xx} ~~xx~~)

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xx) C. à Linné Systema Naturae (ed. Vol. I, part V. page 3011; cfr. p. 2912.

xxx) Fauna Grønlandica p. 253. The diagnosis is of Linné, slightly changed: "Oniscus Ceti, ecaudatus, segmentis distinctis, pedibus tertii quartiue linearibus mollibus." Grønland. Arberub-Koma.

xx)
xx) P. 69, t. 119 f. 13-17 (Male and Female). "Oniscus ecaudatus, segmentis sex distinctis, pedum tertii quartiue paris ultimo articulo ventricosio mutico" (Linné's diagnosis is thus somewhat changed according to the studied form). "Specimina hic descripta ad gingivas circa radices dentium Monodontis capta sunt."

The species could not be determined from the description, but although the drawings are poor, there can be no doubt, that C.nodosus m., is represented.

In his earlier works ^{*)} J.C. Fabricius, just as the majority of his predecessors classified the whale lice as belonging to genus Oniscus, but, without omitting to express his doubt thereabout. Later, but with /p.8/ similar doubt, he classified it as belonging to genus ^{**) (***)} Cymothoa ; and latest ^{***)} - to genus Pycnogonum Brunn. together with "P.balaenarum" (-P.littorale), probably without ever having had an occasion of studying any true whale louse. To a certain degree, this may explain, that such an excellent zoologist could have done such an

*) "Systema Entomologiae" (1775) page 299; by classifying the "whale louse" of Martens as belonging to "Pediculus Balaenarum" (-Pycnogonum littorale), he still follows Linné; however, this is corrected (probably according to Pallas, whose work is among the quoted authors) in the "Species Insectorum" (1781), vol. I, page 378, and also in F.'s later works. - "Mantissa Insectorum" (1787) I, page 242.

**) Entomologia systematica (1793), volume II, page 509.

***) "Supplementum entomologiae systematicae" (1795), page 570. The genus characteristics are described here: "haustellum tubulosum conicum absque setis, palpi ad basin haustellati."

unfortunate comparison. At least J.C. Fabricius was not guilty in any confusion between the whale lice and the sea-spiders as genera, or in what was known about them in biological respect; he describes correctly the former as living "in Balaenis", and the latter "under rocks".

Already in 1797, Latreille ^{★)} set up the genus Cyamus as the true whale louse, and characterised it more or less correctly; in Lamarck's "Système" (1801) ^{★★)} we find the whale lice and the sea-spiders separated again - "Pycnogonum balaenarum" (as the latter unfortunately continued to be called still for a long time) among "Arachnides palpistes", Cyamus Latr. (whose characteristics contain material inaccuracies) in the first section of "les Crustacés sessilocles" between Gammarus, Asellus, and Caprella on the one hand, and

★) "Précis des caractères génériques des Insectes, disposés dans un ordre naturel" page 199. The Cyamus genus here is placed among "Myriapodes" together with Asellus, Oniscus, Julus, and Scolopendra. It is characterised:

"Quatre antennes très courtes, antérieures coniques, de quatre articles, dont le dernier fort court; postérieures insérées inférieurement, plus courtes que la tête, de trois articles. Antennules (-mandibles?) obsolètes. Corps ovale déprimé, crustacé. Tête distincte. Six anneaux. Quatorze pattes; les deux premières plus petites, insérées sous la tête, les 1, 2, 5, 6 et 7 paires terminées par un crochet". Pycnogonum is, on the other hand, placed among "Acephala", i.e. Arachnids.

★★) Système des animaux sans vertèbres, page 166.

Ligia and Oniscus on the other. Bosc (1802) ^{*)}, still maintains the latter viewpoint of J.C. Fabricius, without missing the fact, that the whale louse, of which he gives the best picture yet available, possessed quite different characteristics from the ones he ascribes to the other species of "Cyame ^{**)} (Pycnogonum Fabr.)".

*) "Histoire naturelle des Crustacés" II, p. 202, plate 16, fig 2. - Blumenbach, who ("Handbuch d. Naturgeschichte") closely followed the 12th edition of Linné's System, distinguished the whale lice from the sea-spinner, and classified the former as "Oniscus ceti" and the latter - "Phalangium balaenarum", but called them both "whalefish lice".

**) The genus diagnosis of Bosc, which is a verbatim loan from Lamarck is the following: "quatre antennes inégales; les deux antérieures plus longues, setacées. Un sucoir (!) simple retractile, sortant d'une fente courte située sous la tête. Deux antennules (by these here, one should understand the first pair of legs and not the mandibles) insérées à la base de la bouche. Deux yeux. Corps ovale, déprimé, à six segmens pedifères. Six paires de pattes, chaque patte (!) terminée par un crochet". The description of the whale louse itself, is actually rather accurate, except the exaggerated (doubled) size (30 mm. length, and 15 mm. width) which he ascribes to it, and the description of the mouth, which is "formed of a conical snout with small-antennae" etc., to extensive to discuss here. He denies (misled by his impression of the mouth as a sucking-mouth) that they could gnaw the skin of the whales: "le Cyame ne peut que faire un trou avec sa trompe et sucer le sang ou la graisse de la baleine."

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The first exhaustive and basically accurate characteristic of a Cyamus was made by Latreille (1803) <sup>/p.237/
x)</sup> ; but peculiar enough, he says that it is described from an individual he had found on a fish (!) in the Parisian-Museum, and another place in the same article, we see that it appears to come from the gills of a fish of mackerel family." Regardless how much reliability and accuracy otherwise is credited to this excellent zoologist, there can still be no doubt, that only some error may justify this confusing statement. Just as in the same author's "Genera" (1806), in which all the isopods are referred to as "Insecta tetracera",

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-Concerning the other species of the genus - the Pycnogonum (in Brünnich's and the present concept) it is said, that "some authors say, that it lives on whales, other say - it lives under rocks, but its snout and curved claws testify that it lives on blood (!) and attaches itself to other animals in order to suck from them, thus it is only accidentally, that they are found under rocks." - Same author's article "Cyame" in "Nouveau Dictionnaire d'histoire naturelle" (1803), vol. VII (Déterville) is fully in agreement with the article in "Histoire des Crustacés."

x) Histoire naturelle générale et particulière des Crustacés et des Insectes (Suites à Buffon, Sonnini) Vol. VI (An. XI) page 328. The drawing is a copy of Bosc's drawing. Latreille states, that his description is made after "un individu que j'ai trouvé sur un poisson," but some of its features are taken from a male, and some from a female. The Cyams are placed here in "la famille des Crevettines" together with the Phronima, Talitrus, Gammarus, and Caprella.

the Cyamus-genus has its completely legal place in the "Gammarinae"- family (in the Second Order: "Branchiostomata" of "Crustacea Malacostraca"), immediately following the genus Caprella in opposite to which the genus-characteristics are determined in the last-mentioned work ^{*)}. To begin with, Leach ^{**)} had set up the genus Panope ^{***)} for the Cyami of Latreille, a name, which he later changed to Larunda; neither the latter name did succeed in remaining. Leach too grouped the whale lice together with the Caprellinae. It was no progress, when Latreille ^{****)} later (1817) placed these two genera Caprellae and Cyama among the Isopods, as "Isopodes cystibranches", except that these animals from now on formed their own sharply delineated group among the arthropods, which even in the same year (?) ("Nouv. Dictionn. d'hist. natur. vol. X, -----

*) Genera Crustaceorum et Insectorum I, p. 60. Compare with the same author's "Considérations générales sur l'ordre naturel des animaux composant les classes des Crustacés, des Arachnides et des Insectes; avec un tableau méthodique de leurs genres disposés en familles." (1810), page 104.

**) Edinburgh Encyclopaedia, VII (1813014), Art. Crustaceology, page 404. I was unable to use a later article of the same author in "Supplem. Encycl. Brittan." vol. I, page 420, plate 21.

***) A general arrangement of the classes Crustacea, Myriopoda and Arachnides, with descriptions of some new genera and species (Transactions of the Linnean Society Vol. XI) page 363 (1815).

****) Cuvier, Le Règne Animal, vol. III, page III.

☆) page 277") was raised to one of the six orders of the Crustaceans, under the name of "Laemodipodes". In the "Règne Animal" it is still stated, that Cyamus ceti lives "plus particulièrement" upon the whales, but this is stated without any limitation in respect to the Pycnogons. Lamarck (1818)^{☆☆}, however, modifies this statement and says that Pycnogona are found: "under stones /p.10/ near coast and on whales", a meaning as previously explained, which only supports itself by the unfortunate confusion of Baster, and the similarly unfortunate special-name "balaenarum", which Linné consequently gave to the common North-European "Phalangium (L.)" -or to Pycnogonum - species. Incidentally Lamarck classifies the Cyamus-genus as belonging to the Caprellinae family, which corresponds to Latreille's "Cystibranches" or Laemodipodae; the characterization of the genus is still rather defective. But for the first time one gets a hint, that perhaps there is more than one Cyamus-species, since a remark is added: "Latreille knows another very small, East-Indian species which is still not described."

☆) Quoted after Leach (Dictionn. d. sciences natur. vol. XII, page 72); Second edition of "Dict. d'hist. nat." was not available to me.

☆☆) Histoire naturelle des animaux sans vertèbres, vol. V, page 171-175.

Nothing new was added by the treatment of the systematics of the Crustaceans by Desmarest (1823) ^{*)}. According to what Latreille says in the Second edition of "Règne Animal" ^{**)} the Caprellids and Cyamids form actually only one genus, which according to its right of seniority might be called Cyamus; three species are stated belonging to the sub-genus "ovalia" or Cyamus pr. (Larunda Leach), of which only one species, with the name "le Cyame de la Baleine, the best known species, which also lives on mackerel" (!); another very similar species, brought back by Delalande from his voyage to the Cape; and finally a much smaller species, "which lives on whales in the East-Indian Seas. The false assumption, ^{***)} that the cyamids may also occur on gills of some fish ^{**)} of mackerel family, reappears also in Risso's works ^{**)}, who mentions particularly the tunas, as their host and

*) Considerations générales sur la classe des Crustacés (1825) (A reprint from "Dictionnaire des sciences naturelles (ed. Levrault), vol. 28, page 364. - Still in the 44th volume of this work (1826) we are informed that Pycnogonum is a marine animal generally called "poux de la Baleine").

**) Cuvier, le Règne Animal (Second edition), vol. IV, page 127 - 129 (1829).

***) For example: Encyclopédie méthodique, Entomologie par Mr. de Latreille (1825), vol. X, page 217.

**) Histoire naturelle des Crustacés des environs de Nice (1816), page 131. However, the description by Risso appears to be original, when he gives measurements (length: 12 millimeters, width - 8 millimeters). Whether Risso

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the tunas, as their host and by adding that the latter appear to suffer much from this, and that when they are heavily settled with these parasites, appear to be enraged and jump up out of water. An information showing that a confusion must had taken place here with the Brachiella Thynni parasitising in the operculum of Albecores and other Thynnus-species parasitising on Brachiella Thynni ^{★)} _{★★)}.

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had been specimens from some whale occuring in the Mediterranean (Fin back whale : "Baleinoptère"?), or whether he took for granted, that there had to be whale lice ("Cyamus ceti") on the Mediterranean whales, and used specimens of Scandinavian whale lice, - this I must leave unanswered. In his later work: "Histoire naturelle des principales productions de l'Europe meridionale et particulièrement de celle des environs de Nice et des Alpes maritimes." Vol. V (1826), page 101-103, Risso united Laemodipodes and Pycnogonids into one group, in which the Caprella and Nymphon are placed side by side and the whale lice are classified as belonging to the genus "Pygnogonum, Ciame."

★★) Steenstrup & Lütken: "Contribution to the Knowledge to the High-Sea Parasitic Crustaceans and Lernaea etc. Royal Danish Science Association's Publications. V-Section, Natural Science and Mathematics branch. Volume V (1861), page 420 (80).

Not to interrupt the historical sequence of the systematizing authors, whose treatment of the natural history of the whale lice I have presented here as briefly as possible, I was forced to omit at their proper chronological places /p.239/ two authors, who during the entire discussed period accomplished most in describing the exterior and interior structure of the whale lice. Namely, J.C. Savigny, the first part of whose famous "Memoirs" was published already in 1816, and could thus be used in the editing of the first edition of "Règne Animal" of "Hist. des animaux sans vertèbres" and "Considérations" (Desmarest) - and Trevinarus. Savigny^{*)} was the first to analyse the mouth parts of Cyamus, and his presentation of these parts probably is basically correct; but he made a peculiar error in addition to the two small simple eyes on the rear side of the head, he ascribed it another pair of (merged) (?) large, composite eyes, which were to include the front margin of the head below the antennae - a characteristic, which thus is ascribed the whale lice^{**)} on Savigny's authority in the above-mentioned systematic works. Drawing and description of the exterior

*) Mémoires sur les animaux sans vertèbres, première partie, plate VI. I, page 54 and 110. It says concerning the pycnogona: "les P. ne sont point parasites à la manière des Cyames. Il paraît qu'ils s'attaquent principalement aux coquillages bivalves."

**) Also Say repeats this error in the genus-diagnosis ("eyes two, stemmata two"), although he produced an original description. (An Account of the Crustacea of the United States: Journal of the Academy of natural Sciences of Philadelphia, Vol. I, part 2, page 392).

of the whale lice by G.R. Treviranus ^{★)} was good; his concept of mouth parts, on the other hand, is incomplete and his information concerning the interior structure is perhaps basically accurate, but are far from numerous.

In this period of the history of Cyamus-genus we also have Say's description of a (hardly recognizeable) 1/10 inch long Cyamus-species (C.abbreviatus) taken from an unknown Balaena- species.

Thus the conditions were still in 1830-ies; the exterior structure and the composition of the mouth parts of the Cyama were generally well-known and properly understood. The same might have been said about their systematic position, as they are the closest related to the caprellae and through the latter also related with the Amphipodae. But although one had observed the whale lice on three different Scandinavian whale species (bowhead, narwhal, and humpback whale), this fact remained completely unnoticed, and nobody thought, of this reason, to suspect the presence of more than one Scandinavian Cyamus-species. On the other hand, it was suggested that two other species lived in the Southern Seas. In 1834, this was confirmed by Roussel ^{★★)} de Vauzème, whose studies of the whale lice

★) Abhandlungen über den innern Bau der ungeflügelten Insekten. Siebente Abh. Die Wallfischlaus (Vermischte Schriften anatomischen und physiologischen Inhalts von G.R. and L.C. Treviranus, Second Volume (1817), page 3, plate I).

★★) Mémoire sur le Cyamus ceti (Latr.) de la classe des Crustacés (Annales des sciences naturelles, seconde série, vol. I (Zool.) (1834), page 239 & 257, plate 8-9).

in the Southern Seas, were epoch-making in this contribution to Cetology. He had occasion to carry out his studies, while serving as doctor on board a French whaler in the South Atlantic near Tristan d'Acunha and Maluins. He was the first to teach the zoologists to discern between the three species living on the Southern whale (*Balaena australis*) (*C. ovalis*, *erraticus* and *gracilis*); he presents a detailed description and anatomic study of the first one of these species, and brief characteristics of the other two; he presents good pictures of them all and finally, he offers interesting biological information. Unnoticed does the author answer the objection, presented him by Milne-Edwards and Audouin, that *C. gracilis* might have been a juvenile (of *C. ovalis*) and not an independent species, one still sees that as late as 1838^{*)} M.E. was in doubt about the independence of these three species, pointing out to the considerable age differences, which he himself had proved previously^{**)} in *C. ovalis* by comparing the adult female with the small juveniles found in its abdominal cavity. Later he came to another result and in his "Histoire

*) In the new edition of Lamarck's "Histoire naturelle des animaux sans vertèbres," volume V, page 269.

**) Observations sur les changements de forme que divers Crustacés éprouvent dans le jeune âge. (Annales des sciences naturelles, seconde série, volume 3 (Zool.) 1835, plate 14, fig. 13 - 14.

naturelle des Crustacés (1840) ^{★)} he accepts the three species of Roussel, but commits a serious error by identifying C.erraticus R.V. with the whale lice described and drawn by the older authors (Seba, Linné, Pallas, deGeer, Abildgaard, J.C. Fabricius, Lamarck, Latreille, Leach, and Desmarest). Among these lice, besides those from the bowhead, two other species were hidden, all three different from C.erraticus; or with other words, all the living Scandinavian whales (particularly the bowhead), and the whale-lice forms more or less known at that time. Besides the three species of Roussel C.Delphini Cuérin is mentioned ^{★★)}, a species still unknown today. Errors done by Milne-Edwards were partly corrected by Krøjer (1843) ^{★★★)}, who proved that the Scandinavian whale louse, which he described under the name of C.ceti, was different from C.erraticus. However, Krøjer

★) Vol. III, page 110. M.E. has dropped out the story about that there are also cyamae on fish, but he does not inform us, what might have been the basis for Latreille's definite information in this respect. (Perhaps the not uncommon confusion between dolphins and porpoises ?). But he still lets the pycnogona live upon fish, which is hardly the least correct information.

★★) Iconographie du Règne Animal, Crustacée, plate 28, fig. 5-5a. According to Spence Bate it was taken from the genitals of a dolphin, near the Antilles; I myself was not able to use the text of Guérin's work, quoted by Sp.B.

★★★) Concerning Cyamus Ceti ("Naturhistorisk Tidsskrift" /Journal of Natural History/ vol. 4, page 474 and the follw. p.).

committed an error himself accepting only one Scandinavian whale-louse species. He could have learned from what already was available on this matter in the Scandinavian literature, that his assumption was correct, that "the Cyamus-species, as a rule, have definite whale species as habitat" (what probable is basically the case), then the forms described by Martens and Abildgaard should be other species, then the ones Otto Fabricius was studying. We cannot understand, why an article in "Zoologia Danica" is indirectly (i.e. without being specifically mentioned) is excluded by Krøjer from the "reliable and applicable information concerning the occurrence of these animals, which the Science possesses until now", or how come this knowledgeable zoologist might have omitted to notice, that the "whalefish louse" of Martens did not come from a finback whale, but from a rightwhale. This negligence furthermore pushed Krøjer to the confusing assumption, that the form described by him (parasites of the bowhead) was the one, which lived upon the humpback whale (the Krepokak).

Since that time, not many contributions were made /p.241/ to the history of the Cyamus-genus, except my brief report at the Naturalist Congress in 1860, P.H. Gosse gave (1855) ^{x)} a description of the new species (C. Thompsoni) taken from a bottlenose whale, and Spence Bate has

x) Notes on some new or little known marine animals, fascic. II (Annals and Magazine of natural History, Vol. XVI, 2d series, page 30 - 31.

x) in two works discussed the Cyamus-genus in general, and partly its assumed British species. Since I will often have an opportunity later to discuss these works, it is not necessary to give them any detailed discussion now; a discussion which under any conditions hardly could be very praising. It must be sufficient to add, that these works have not made my work superfluous, and that there seem to be no justification, when Sp.B. and other English authors ^{xx)} claim all the South Sea species of Roussel as English. Finally, I must

x) C. Spence Bate and J.O. Westwood: a History of British sessile-eyed Crustacea, Vol. II, p. 97-98 (1866) (C.ceti, ovalis, gracilis and Thompsoni). - Spence Bate, Catalogue of the specimens of Amphipodous Crustacea in the collection of the British Museum (1862), p. 366 - 368, table 58.

xx) C. Spence Bate: A Synopsis of the British Endriophthalmous Crustacea part I. Amphopoda (Ann. a. Mag., 2d Series, vol. XIX (1857), page 152 and vol. XX, page 525).

A. White: A popular history of British Crustacea (1857) page 219. - Only under assumption that the whale-lice species of the southern whales also lived on the Nordkap whale (compare: page 243 and 244, Note 49), these species might possibly be accepted in the European (British) fauna. -

I was not able to use neither White's "Catalogue of British Crustacea", nor Gosse's "British Marine Zoology", but I do not assume that any information on this subject thus missed me.

mention the work of Dr. Alex. Brandt on Rhytina's whale louse, to which I will return later. I have forwarded the diagnoses of the Scandinavian species, known to me, to Mr. Axel Boeck, in whose book on the Scandinavian Amphipoda^{x)} they will be included.

I hope to have somewhat succeeded in this compact historical exposition, to present how the knowledge of these animals has developed, what errors have accompanied and partly inhibited this development, what was the situation, when I began to occupy myself with this subject. Perhaps, I have included some matters, which are so unimportant, that they could easily have been left to oblivion. By including such matters, however, I may save other scientists unnecessary work. On the other hand, I hope that nothing important in the history of the Cyamus-genus was omitted against my will, or not elucidated accurately enough.

Only few general questions are left to embark upon, before I will begin to discuss my task proper: the distinction of the species. Below I have described nine species, the origin and hosts of which are known. Four of these species are new, as far as they have not p.14 received own special names and no description of

x) Crustacea amphipoda borealia et arctica. (Christiania Vidensk. Selsk. Forhandl. for 1870), page 279 - 280. The final review of my work has caused few changes in the diagnoses to the form presented here.

them was published (C.monodontis, boopis, nodosus, and globicipitis); one of them (C.monodontis) is previously not mentioned in the literature at all. These nine species are found on the baleen whales, and on the toothed whales, as we will see from the following survey:

Among Baleen Whales the whale lice are known upon:

Bowhead (Balaena mysticeti): Cyamus mysticeti m.

Southern whales (Balaena australis, and B.japonica ?) : C.ovalis, erraticus and gracilis R.V.

Humpback whale (Megaptera boops): C.boopis m.

Among Toothed Whales - upon:

Pilot whale (Globicephalus melas) : C. globicipitis.

Narwhal (Monodon monoceros) : C.nodosus and C.monodontis m.

Bottlenose whales (Hyperoodon rostratus and H.latifrons) : Platycyamus Thompsoni (G.).

Furthermore must be added 1) the below-described (but still somewhat doubtful) C.pacificus, whose host is unknown; 2) a species from the North Pacific (C.Kessleri Brandt), most probably from a Balaena of the group of the southern whales and of the "Nordkap" whales; and finally 3) a probably extinct or destroyed species, about which we have definite historical knowledge, but only very incomplete zoological knowledge, namely C.Rhytinae Br. the whale-louse of the Steller's sea cow, if this species is different from C.ovalis, what I definitely believe to be the case, and whether it was a Cyamus at all, which may be rather doubtful, and which we will discuss further below. But herewith the list is still not exhausted. Several species may be added, the existence of which

is provable, but whose character is still known very incompletely or not at all.

1) The whale louse, which, as Krøyer (l.c.) had pointed out, is mentioned by Bennett as living upon the sperm whale ^{*)}. The latter being a whale on which Roussell could not succeed in finding any Cyamus. The possibility in this enumeration must not be forgotten, that C. pacificus, whose host is unknown to me, might have been the louse of the sperm whale). 2) The whale-lice found by several authors on more or less unknown species of dolphins, of which the best known is the C. Delphini found

*) Krøyer quotes (l.c. page 485) a report from F.D. Bennett in "Proc. Zool. Soc." 1837, page 39, in which these parasites are called Onisci. In the same author's somewhat later "Narrative of a Whaling voyage round the Globe", Vol. II page 169 (1840) they are called outright "Whale-lice (Larunda ceti)". But same place further down on page 237 it is said about "a dolphin, which was larger than the ordinary dolphin (Delphinus delphis), and which in the spaces between its teeth, in both jaws, had cavities to receive teeth from the opposite jaw": "some Onisci adhered to the body; and a cluster of the elegant soft barnacle, Otton Cuvieri, was pendant from the lower jaw." It is also said on page 234 about "the Blackfish of South Sea Whalers": "a few Whale-lice (Larunda ceti) adhere to the skin of this Cetacean."

by Guérin-Ménéville on a dolphin in the West Indies, and which is not known to be found again. Specimens are kept at the Museum, which are different in all respect from the above mentioned species. These specimens are reported to be taken from "a dolphin" (unknown from /p.243/ where); since, furthermore, these specimens are not fully adult, I have not ascribed them any special name, and ^{★)} I have not included them in the above-survey.

3) The species, which is assumed to live on the now very rare, or perhaps extinct, "Nordkap" whales, or "Sards" (*Balaena glacialis* or *biscayensis*). On a lithography belonging to Prof. Reinhardt is a drawing of a whale which stranded January 17th, 1854, on the beach of San Sebastian, carrying a subscriptum: "drawing from nature of a dead whale on the beach of San Sebastian, January 17th, 1854; made in accordance with the directions of Dr. Mone-dero", there is also a picture of a creature, concerning which the subscriptum gives the following information: "A, drawing from nature of a whale-louse; many of these were found on the head and on the uper portions of the body." But peculiar enough, the drawing of this "whale louse" does not represent a Cyamus, but a Pycnogonum! The so common earlier confusion between these two animal forms has probably given reason for the new "qui pro quo", and

★) According to Bennett's above-stated observations of whale-lice on a not-further identified dolphin-species, and on "the Blackfish", by the latter, as informed by Prof. Reinhardt, should we understand - Globicephalus macrorhynchus, of which the "College of Surgeons" is in possession of a skull given by Bennett himself.

a picture of a "sea spindle" was used instead of the picture of a real whale-louse^{*)} (and to make matters worse, - of a completely unknown one).

If we leave out, the now completely extinct form, which lived on the Steller's sea cow, we still have certainty of the existence (at the present time) of at least 15 or 14 species, of which approximately one half lives on baleens (right whales and humpback whales), one half on the toothed whales (dolphins (?), pilot whales, bottle-nose whales, sperm whales, and the narwhal), however, strange as it may seem, one did not find a single species upon a true finback whale (Balaenoptera), regardless that certain finback whales; for example, B.Sibbaldii, were objects of catch and at the same opportunity, of study for possible parasites^{**)}. Although, I am still inclined to believe, that the number of more or less known cyamids is much below their real number, it may still be doubtful, whether more than a minority of whale species are troubled by these parasites^{***)}. As a rule, as far as we know by today, the same Cyamus-species occurs only on one definite whale-species, and therefore the Cyamus-species in certain cases would be

*) Undeniably it is very prudent of v.Beneden, nevertheless, to equip the species with a name (C.biscaven-sis). (Les Cétacés, leurs commensaux et leurs parasites, Bull. d. l'Acad. royale de Belgique, 2me série, volume 29, 1870, page 349.)

**) According to S.Hallas: "Notes on a few of the observed whales during a whaling expeditions in the sea around Iceland. (Scientific reports of the natural-historic association, for 1867) page 162. /continued bottom of next page./

able to contribute to the distinction and description of the whale-species. The undisputable exception from this rule, that is best known to me, is the common and broad-foreheaded bottlenose whale (TR: *Hyperoodon latifrons*), who house the same species of the whale-louse (*Platycyamus Thompsoni*). The extensive geographical occurrence, however, which must be ascribed to certain species living on the "southern whales" (*C.ovalis* and *gracilis*) seems to indicate, that these species occur /p.16/ not only on the true *Balaena australis*, but also on its representatives in other seas, and namely the *B.japonica*, if the latter, what I do not dare to claim, is different from *B.australis*. The rule must, probably be changed, to the following: the same *Cyamus*-species can occur on very closely related whale-species, and particularly upon species of the same sub-genus. The experience had shown, on the other hand, that the same whale-species (for example, the narwhal, the southern whale) may house several whale-lice species. One may seek unsuccessfully for any connection between these species and their "hosts" in their systematic relation-conditions: *C.monodontis* (on the narwhal) is so close to *C.mysticeti* (on the bow-head whale), that the former may easily be assumed to be a "migrated subspecies" or a dwarf-form of the latter; the southern whale *C.erraticus* stands very close to the Scandinavian humpback whale *C.boopis*.

/continued from the previous page/

***) Dewhurst goes certainly too far, when he expresses the opinion, that all the whale species are troubled by whale-lice (The natural history of the order Cetacea etc. 1834, p. 259).

/It might be of interest to compile in one place a list over all the known parasitic and semi-parasitic crustaceans of Amphipoda, Cirripeda, and Copepoda groups, found on the whales. Among the latter are:

1. Pennella crassicornis Stp. & Ltk. (parasitic crustaceans and Lerneae. Page 416, plate XIV, fig. 34) (From the bottlenose whales).

2. P. sp. on the Scandinavian humpback whales (See: Transactions of the Scandinavian Naturalists' Association's 4th Congress, in Christiania, 1849, page 280: Hallas l.c., page 169) (from v. Beneden l.c., page 356, stated as P. Balaenopterae).

On the other hand, it is a rather serious misunderstanding, when professor v. Beneden records Lernaeonema nodicornis Stp. Ltk and Pennella pustulosa Baird as parasites of dolphins. They are both taken from Coryphaena-species: fish of the mackerel family!

Prof. Steenstrup, who made a special study of the Cirripeda, was so kind to inform me as follows:

"The species of Cirripeda, known to me are connected (but not as parasites, but as inhabitants or permanent travel-companions) to the whales, are only 6 in number, and all belong to the one and the same natural group: Coronulinae, a group, which on the other hand is almost limited to the whales, since only species of one genus, the Platylepas occur on other animals than the whales (on sea-serpents, sea-tortoises, and on the manatees).

1. Coronula balaenaris (Gmel.)

on the northern and southern South Sea right-whales and on the "Nordkap" whale in the Atlantic (Chemnitz's specimen, Chemn. Conch. VIII, plate 99, fig. 845, 846).

2. Coronula diadema (Linné) (Syst. nat.)

on the Atlantic humpback whale (Megaptera bocps); but individuals until now sent from other seas could not be distinguished from this species (for example an individual from the South Seas (New Zealand ?) according to Darwin's study, or a Cape (?) individual in my study).

3. Coronula reginae Darwin

on whales (which ones ?) in the Southern Sea (an excellent species !)

4. Tubicinella trochealis (Shaw)

on rightwhales from the northern and the southern South Sea (as number one), and on a whale beached in 1650 (Nordkap whale ?) near the Suderø (Faeroe Islands). (see Ole Worm's figures and descriptions : Mus. Worm, page 281).

5. Xenobalanus globicipitis Stp.

on the pilot whales (from herds caught at Faeroe Islands).

6. Xenobalanus strictus Stp. (Siphonicella Darw.)

on the fins of the true dolphins, of several species, in the warmer areas of the Atlantic Ocean.

"When Van Beneden in his report on the parasites and "Commensales" of the whales, l.c. page 349-55, enumerates not less than three new (named, but not diagnosed) whale-coronulae, namely:

a) Diad. japonica van Ben.

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on a Balaena japonica.- according to a Japanese drawing;

b) Diad. californica van Ben.

on the Megaptera antarctica, according to a shell, which he assumes might have come from this species; and

c) Diad. biscayensis van Ben.

on the Nordkap whale, according to a reliable report of the Icelanders;

- these names are obviously ill-timed, because:

c. - probably (until the opposite is proved) must be considered to be the species, which was sent to Chemnitz from a Nordkap whale, and

b. - is rather - (if it is truly a species) - Cor. reginae, so well described by Darwin, and left unnoticed by Van Beneden, and finally:

a. - is the Cor. balaenaris, which together with Tubicinella is the Balaena occurring in the northern part of the Southern Sea." 5

"The species of the coronula probably to a certain degree connected to some species-groups of whales and thus have parallels with distribution conditions of their relatives, Chelonobiae and Platylepadae. To place the cyamids and the balanae in the same main category of the "Commensalism" merely as free and attached guests (Commensaux) is obviously unfortunate."

"When the conchoderms (Otton, Cineras) appear on whales, they belong to a completely accidental category. They attach themselves to whales of the same reason, that they attach themselves to ships and turtles, to fast-moving hosts of any kind, and appear thus only to use the whales, when the latter furnish a solid foundation to attach to, such as coronules, bare surface of teeth, or bony portions." /

I shall not hide, that among crustacean groups, of which I made a specialized study, none caused me as much difficulties as the whale lice. The special distinction by means of good, easy to see, and reliable features, is complicated especially by age and sex differences. Only by having a larger amount of material, one may reach a certain degree of certainty, that a form is truly present in its fully developed appearance. Only the fully adult specimens have the completely developed special features. More than once I made unexpected discoveries of the considerable difference, that a small difference in size may cause in this respect. The younger the whale lice are, the more the characteristics are obliterated, the form turns generally slimmer, the gills shorter, the characteristic form relations disappear, even organs (for example: bi-gills) by which one may identify the adults, disappear. To distinguish the species in such young individuals, as, for example, one finds in a female's brooding sac, is completely impossible. Perhaps Platycyamus might constitute an exception, the very young of which are unknown to me. The closer the individuals are to their first development stage, the more difficult, of course, is the distinction. When we do not know which whale-species had fostered them, even the half-grown specimens cannot always be determined with certainty. The sexual differences do not limit themselves in partly or completely developed individuals, to the external genitalia's place or shape, but they penetrate many other form-features, although to various degrees in various species, as it will be shown below. The

sexual difference appears already in the size, the female of the true Cyami as a rule is considerably smaller. /p.18/

Secondly, the difference presents itself in shape (the female is broader, the male - narrower), the antennae and the gills of a female are longer, the bi-gills have a more chubby shape etc. than of the males. A feature found in a female of one species, often does not apply to the male of the same species, but is found in a male of a different species, etc. In every description of a Cyamus it is thus imminently important to know, if this description is of a male or a female, an information almost never mentioned in the older descriptions (Krøyer's descriptions not excepted); however, in many cases they may be deducted indirectly, when one knows well the appearance and structure of the two sexes at various ages.

One of the known whale-louse species differs so much from the other species, that I had to distinguish it into its own genus (Platycyamus). The other species appear to me to fall into three groups, the two of them with three sub-groups, as follows: |

- A. a. C.mysticeti and C.monodontis;
- A. b. C.Kessleri;
- A. c. C.erraticus and C.boopis (with C.pacificus);
- B. C.ovalis;
- C. a. C.nodosus,
- C. b. C.globicipitis, and
- C. c. C.gracilis.

I have set up in the following manner the most important features of the genera, groups, and species

(except for the still dubious *C. pacificus*):

Survey of the Whale-Lice Species (Synopsis
Cyamidarum).

I. CYAMUS Latr. ^{*)} - the body more or less thick.

The first pair of legs is much smaller than the second one, and hidden under the latter. The first body segment is incompletely separated from the head, or sometimes even completely merged with the latter. The maxillipeds are five-segmented (the males attain generally a considerably larger size than the females).

A. The body is more or less wide and oval; the gill-bearing segments (third and fourth) are noticeably smaller in the males (shorter and generally /p.247/ weaker developed), than the subsequent segments, and also are of a different form. The gills generally are rather long in the adult individuals; the second leg pair's hand is always bi-dentated, and the first body segment, as a rule is rather unrecognizable as such. These are generally larger forms).

a. The gills are simple; the hips of the rear-legs are equipped with a strong spine or a blunt nodule in the extreme front-corner. The gill-appendices are bicornate in males, and simple in females.

*) As far as I could find out the use of the word Cyamus in Botany (by Salisbury or Smith, Synonym to Nelumbium) is several years younger than 1797, namely from 1804 or 1805, therefore there does not seem to be any reason to prefer any of Leach's names, although Cyamus is a "nomina recepta" in Botany.

a. Plumper forms with thicker, more rotund gills; the latter are always shorter than the body and the head put together.

a. Wider (the width is one half or more than one half of the total length); the teeth on the hand of the second leg-pair are separated by a larger interval.

1. C.mysticeti m. (Plate I, fig. 1)

(From a bowhead whale : Balaena mysticetus).

It is larger; the gill in an adult male protrudes far above the head; the gill-appendices in a male are double (bicornate), the anterior horn is, however, much shorter; the hand of the first leg pair has, also in a female, a distinct tooth; and the fifth body segment has two or four small spines in the male, and four in the female.

2. C.monodontis m. (Plate I. fig. 2).

(Narwhal: Monodon monoceros).

It is smaller; the gills in an adult male do not protrude above the head; the anterior horn of the /p.20/ anterior gill-appendices (in a male) are undeveloped. The tooth on the hand of the first leg-pair is less distinct than in a female; the fifth body segment in the male is without spines, in a female it is equipped with two nodules.

b. It is narrower (the width of a male is less than one half of the total length); the teeth on the hand of the second leg-pair sit closer together.

3. C.Kessleri Brandt (Plate II, fig. 3)
(Balaena sp., in the North Pacific Ocean).

Gills in both sexes protrude far above the head and are almost twice as long as the body is wide; the gill-appendices are double (bicornate), elongated, almost filiform in the males, the anterior horn somewhat shorter than the posterior one. In the females the gill-appendices are single and shorter, the anterior ones are thick, and the posterior ones - thin. The males have a horizontal spine at the base of the gill-appendices. The males have no spines on the ventral side. The females have 4 nodules on the ventral side of the sixth segment. On the hand of the second leg pair the front teeth are the shortest ones.

B. Slim, lighter built forms with wide notches between the body segments. The gills are rather long, or even very long, thin and pointed. Both pairs of gill-appendices are bicornate in males, and simple in females.

4. C.erraticus R.V. (Plate III, fig. 5).
(Southern whale : Balaena australis).

The gills in both sexes reach above the head, and in the full-grown male are longer than, or at least as long, as the body and the head put together. The fifth and the seventh body-segments have two spines each on the ventral side, - the sixth segment has four.

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5. C.boopis m. (Plate III, fig. 6).
(Krepokak : Megaptera boops; perhaps also on other Megaptera-species.)

The gills are shorter than the body both in females and in males. The male has two spines on the ventral side of the last two body segments, the female - on all the three.

b. The gills are double. The spines located on the hips of the rear-legs, in the interior front-corner, undeveloped.

7. C.ovalis RV. (Plate II, fig. 4).

(Southern whale: Balaena australis and the North Pacific rightwhale: B.japonica ?).

The gill-appendices in males are elongated, filiform, first pair is single, the second pair is double. The gill-appendices are absent in females. The teeth on the hand of the second leg-pair are arranged very close together.

B. The body is narrower, more elongated; the gill-carrying segments in the male are often insignificantly, or not at all, weaker than the subsequent ones. The gills are generally shorter. The hips of the rear-legs are without the spines underneath in the external front-corner. The first body-segment is completely merged with the head. (Smaller forms).

a. The hand of the second leg-pair in both sexes is bidentate.

8. C.nodosus m. (Plate IV, fig. 8).

(The Narwhal: Monodon monoceros).

The back has a nodulated appearance, because the body-segments (starting from the third segment) are

divided into two or four humps. The gill-appendices are simple, short, conical in both sexes. The ventral side of the body has no visible spines, neither has the underside of the rear-legs.

B. The hand of the second leg-pair is one-toothed in both sexes.

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9. C. globicipitis m. (Plate IV, fig. 9).

(Pilot whale: Globicephalus melas).

The upper antennae are extraordinary powerful and thick, the bottom ones - very small, un-divided. The posterior branch of the gill-appendices is short and conic (spine) - shaped in both sexes. The anterior branch is gill-shaped in the males, and almost as long as the gills themselves. They are absent in the female. The last three body segments in the male (two last ones in the female) are equipped underneath with two strong spines or pointed nodules each. All the six rear-hips in the front also form a strong spine.

g. The hand of the second leg-pair is single-toothed in the adult male, and toothless in the female.

10. C. gracilis R.V. (Plate IV, fig. 10).

(Southern whale: Balaena australis and the northern Pacific rightwhale: B. japonica ?)

The rear body-segments are indented on the sides. The males have small bicornate gill-appendices. The females have no gill-appendices. No spines on the ventral side of the body or the rear legs.

B. Platycyamus m. The body is very flat, almost paper-thin. The first pair of legs is almost as developed as the second one, and they are arranged in front of the latter upon one from the head well-distinguished first body segment. The maxillipeds are non-articulated. (The males are smaller than the females).

11. P. Thompsoni (Gosse) (Plate IV, fig. 11).

(Bottlenose whales: Hyperoodon rostratus and H. latifrons.)

The antennae and gills are very short. The gill-carrying body segments (third and fourth) are semi-merged in females, in males they are free but less developed than the other segments. Conical horizontal spine at the place of the gill-appendices in males, and a small nodule at the base of the rear egg-plates in females. /p.251/ The fifth and the sixth body segments have two spines below, the seventh has four, all the rear-hips have two front ones.

For the sake of completeness, I will also present the uncertain or insufficiently known species (it is possible that some of them coincide with each other or with some of the above-mentioned ten species).

6. C. pacificus Ltk. from an unknown whale species in the Pacific Ocean (Plate III, fig. 7).

12. Whale louse of the "Nordkap" whale or the "Sard". (See above on page 243).

13. C. Delphini Guérin (l.c. plate 28, fig. 5, copied from Spence Bate and Westwood l.c. vol. II, page 98,

which stands closest to *C. globicipitis*, and is possibly identical with the same, but it is neither identical with *C. gracilis*, as Sp. Bate assumed originally (Catal. Amphip. Crust. p. 366) nor with *Platycyamus Thompsoni*, as it was assumed in his and Westwood's later work (l.c. page 96). From a West-Indian dolphin.

15-17. One also taken from a "dolphin" species, an incompletely known species (see page 242 and the subsequent ones) and the two species observed by Bennett on two different dolphin forms (one of which is a *globocephalus*).

18. Extinct and unknown parasites of the Steller's sea cow. (See below).

1. *Cyamus mysticeti* Ltk.

(Plate I, fig. 1.)

*) Distinguitur corpore lato, crassiusculo, annulis branchiferis (tertio et quarto) marium ceteris minoribus (brevioribus et humilioribus); antennis (superioribus)

*) Detailed special diagnoses are presented in the above synopsis; here and in the following short diagnoses, which are forerunners of the more exhaustive work-descriptions, only the most important main lines of the special features, that are best suitable to guide a student to a preliminary understanding.

caput et annulum secundum fere aequantibus; branchiis simplicibus elongatis, anterioribus caput in faeminis (adultis) aequantibus, in maribus longe superantibus; manibus primi paris denti singulo, secundi dentibus duobus brevibus remotis in utroque sexu armatis; appendicibus branchialibus marium sat magnis, bicornibus, cornu interno brevior, faeminarum unicornibus; annulis corporis posterioribus subtus spiniferis, coxisque pedum posteriorum infra in spinam exeuntibus.

Dimensions: The male: 16 millimeters long, 8 millimeters wide; the female: 11 millimeters long and 6 millimeters wide. ★)

Habitat: on bowhead whale (Balaena mysticetus L.) upon the thinner parts of the skin, for example in the operculum and near the genitalia (according to Martens and Mandt ★★)).

Synonyms and Quotations which apply to parasites of the narwhals with considerable certainty:

★) Here and in the subsequent material the size is always indicated of the largest available specimens, regardless whether the species may also be completely developed and reproductive in a somewhat smaller size.

★★) Mandt (M.G.): Observationes in historiam naturalem et anatomiam comparatam in itinere grönlandico factae (Dissert. inaug. Berolin. 1822) page 10. "Partibus tenuioribus cutis axillis, pudendis Oniscus ceti adhaeret, praesertim si tempus instat coitionis. Vulva praecipue hoc tempore iis obsessa apparet." This may be also compared with what Scoresby, Dewhurst, and O'Reilly stated on this subject (See below).

(1675). Fr. Martens: "Spitzbergische oder Grönlandische Reisebeschreibung" : Die sogenandt Walfisches Laus, page 85-87, plate C, fig. D.

(1734). A. Seba: "Locupletissimi rerum naturalium thesauri", vol. I, plate 90, fig. 5 (male and female).

(1769). Houttuyn: "Natuurlyke Historie of uitvoerige Beschryving der Dieren, Planten en Mineralien", I, XIII, page 491, plate 106, fig. 4-5 (female) ("eigenlyke Walvischluizen nit Groenland").

(1772). P.S. Pallas: "Speciligia Zoologica" fasc. 9, page 76 - 78, table IV, fig. 14 (A, B, C) (male and female) (Oniscus ceti); reproduced in "Encyclopédie Méthodique", Crustacés, plate 239, fig. 14 - 16.

(1778). Ch. de Geer: "Mémoires pour servir à l'histoire des Insectes", vol. VII, page 540-544, plate 42, fig. 6 - 10 (male) (Squille de la Baleine, Squilla Balaeni).

(1802). Bosc: "Histoire naturelle des Crustacés", Vol. II, plate 16, fig. 2 (female ?) (Reproduced from Latreille in "Histoire naturelle des Crustacés et des Insectes," plate 52, fig. 4).

(1816). J.C. Savigny: "Mémoires sur les animaux sans vertèbres," I, 1, plate V, fig. 1." (Cyamus ceti Latr.): (Reproduced in the atlas to "Naturgeschichte" by Oken, plate 19, fig. 3).

(1817). G.R. Treviranus: "Vermischte Schriften anatomischen und physiologischen Inhalts," 9th volume, plate I, fig. 1 (male) and 2-3 (female) (Oniscus ceti).

(1825). Desmarest: "Considérations générales sur la classe des Crustacés", plate 46, fig. 4 (Cyame de la Baleine).

(1842-43). H. Krøyer: "Naturhistorisk Tidsskrift" /Journal of Natural History/ Fourth volume, page 476, plate V, fig. 63 - 70. (Cyamus ceti).

(1857). A. White: "A popular history of British Crustacea", plate XI, fig. 6 (poor) page 219 (Cyamus ceti).

(1866). Spence Bate & Westwood: "A history of British sessile-eyed Crustacea", Vol. II, plate 85, c. fig. (male and female) ^{x)} and plate 90 (juvenile, 1''' long). (Cyamus ceti) (the synonymy is very confused).

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Description of a Male. The body is wide and flat, but rather thick than thin; the length twice as long as the width. One of the largest available specimens is 16 millimeters long and 8 millimeters wide; it is thus the largest known whale-louse species. The head is narrow at the front (the head proper), wider to the rear (first body segment); however, there is no distinct separation. When the upper antennae are bent backwards, they do not reach the third body segment; their fourth (extreme) segment is very small, the bottom antennae

x) The mouth parts seems to be copied after Savigny.

are very small and hidden beneath the upper ones. The second body-segment is rather thick and swollen; the corner between its rear and lateral margin runs out in a small nodule; the same is the case with the front lateral corner of the third and the rear of the fourth body segment. These two segments are noticeably less developed (i.e. shorter and less curving or swollen) than the second and the fifth segments. The first pair of legs is delicate and hidden by the second pair, which just as the three pairs of rear legs have a very powerful built; on the underside of the hand of the first pair of legs there is a very distinct "tooth", and of the second one's - two short and chubby "teeth" separated by a broad and deep cleft. The basic joint (the hip) of the rear legs (fifth to seventh) runs on the underside to the front in a powerful spine, also several of the other joints of these leg pairs are inclined to run into chubby points. There are four well-formed, rather thick gills, the length of which varies somewhat, both with age, and individually:

*) Here and in the further text, the body segments and the legs are going to be called by numerals (I - VII), as they would have had in the true amphipoda, without respect to the fact that the first segment is grown together with the head and the third and the fourth of the segments are without appendages. I am going to call Leg. pairs V-VII "rear-legs". When, for the sake of brevity, I call the basic joint of the leg - "hip", this should not be misunderstood as an expression of a certain concept of this problem, namely that this joint in the laemodipoda corresponds completely to the other arthropoda's "hip".

in very large individuals they are one third longer than the width of the body, and both pairs protrude somewhat beyond the head and beyond the hand of the first pair of legs, even beyond the outstretched upper antennae. In the males of up to 10 millimeters in length the gills are still longer than the width of the body, but the second pair reaches sometimes only to the end of the head of the hand of the second pair of legs, but not beyond the latter. The gill-appendices are relatively large and resemble somewhat crooked crescents. The extreme (rear) horn of these crescents is, however, considerably longer than the interior (front) one, which is actually somewhat more developed at the rear than at the front pair. Four small spines are found on the underside of the seventh body segment: two of them appear close to each other at the front margin of the segment, and at either side closer to the division of the legs; at the preceding (sixth) segment there are 4 or 6, on the fifth - 2 or 4, - one of the pairs seems to disappear with age, so that there are only 4 and 2 respectively; in general these small spines appear to be better developed in the younger, than in the larger specimens. The tail-knob is cleft at the point.

Younger specimens do not possess all the mentioned characteristics. I must add the following to the already above-stated: Already in males of 6 millimeters in length, the gills are so short that the front pair hardly reaches 26 to the end of the head, and the first pair of legs, the ^{one} second/reaches only to the head. Only the extreme horn of the gill-appendices is developed here. The "tooth" on

the hand of the first pair of legs and the spines on the underside of the three first body segments and on the hip-joint of the rear legs, on the other hand, are present. The shape of the body is narrower, more evenly wide along the entire length of it. The third and the fourth segments are much shorter, than the other ones, but their corner nodules, just as the corner nodules of the second body segment, have disappeared. On the still younger males (4 millimeters) the gills are still shorter, the tooth on the hand of the first leg pair is indistinct, but one may still see very distinctly two spines on the ventral side of the fifth segment, four - on the sixth and the seventh ones. If the length decreases to 3 mm., then the width attains 1 millimeter; the shape at this early stage of development is extremely narrow and slim. The gills are quite short, club-shaped, gill-appendices and all the nodules and spines have disappeared, even the "teeth" on the hand of the second pair of legs are not excluded, and the sex-differences are not to be recognized. (A still younger stage (1''') is illustrated by Spence Bate and Westwood, l. c. page 90).

The female does not attain the respectable size of the males; this is probably the reason, why several special features of the male appear less distinct in a female. The largest specimens available were 11 millimeters long and $5\frac{1}{2}$ - 6 millimeters wide. The gill-carrying body-segments are not noticeably weaker or shorter here, than the second and the fifth segments, otherwise of identical shape as the males, with the exception that here also the third body-segments rear lateral corner and

the fourth body-segment's front lateral corner, just as the other segments run into a down-turned rounded nodule. The upper antennae I find sometimes long and weak, sometimes - short and thick. The hand of the first pair of legs has, here too, a distinct tooth. The gills are always considerably shorter than in the males, always longer than the sixth body segment is wide, and the first pair therefore does not reach above the point of the head, or of the second pair of legs, the second pair does not reach over the second body segment, they even are often shorter than stated here. On the ventral side of the seventh body segment the spines act same as in the males, on the sixth segment there are always six spines, and on the fifth, on each side of the vulva there is a double spine, a larger one pointing forwards, and a smaller one turning backwards. Of the two horns of the gill-appendages, we find here only the exterior one; it is conical, more or less pointed, the first pair shorter than the second one *). As usual there are four egg-plates, which are large, round, and hard at the margin.

The smaller size, the shorter gills, and the heavy development of the third and fourth body segment, the adult female may be distinguished from the male,

*) No Cyamus- female at all has double gill-appendices, a feature which is, at least, common in the males. I do not believe to err in assuming, that the front (internal) horn of the gill-appendices is homological with female's four egg-plates (I seen, that Al. Brandt also assumes this to be true).

already when viewing from the rear. In younger females (6 millimeters in length) the tooth on the head of the first pair of legs disappeared and the egg-plates are so small, that they do not touch together.

That the Greenland whale or the bowhead (Balaena mysticetus) houses a whale-louse species, is /p.255/ ^{*)} already indicated by Martens and later by Mandt ,

*) Of other authors, who mentioned the whale-lice as occurring on whales, and preferably or exclusively meaning those occurring upon the bowhead, we will mention here: O'Reilly, "Greenland, the adjacent seas and the northwest passage to the Pacific Ocean, illustrated in a voyage to Davis Strait during the summer of 1817" (1818), page 166: "Groups of the Oniscus ceti, whale-louse, attached to the epidermis, particularly about the fins and anus"; page 196: "immense groups of the Oniscus ceti attached to the under lip and to the under part of the fins" (Place places he speaks of the bowhead). Scoresby: "An account of the arctic region" etc. Vol. I (1820), page 543: "This little animal (Oniscus ceti L., Larunda ceti Leach), about $\frac{1}{2}$ " in diameter, firmly fixes itself by its hooked claws on the skin of the Mysticetus. It is found principally under the fin or in other situations, where the skin is tender, and where it is not liable to be dislodged." Parry: "Journal of a third voyage for the discovery of a northwest passage" (1826), page 118 (concerning a "whale" killed July 1st, at Port Bowen, doubtlessly, a bowhead whale); Dewhurst: "The natural history of the order Cetacea and the oceanic inhabitants of the arctic regions" (1834), page 199: "and like most other animals the whale is tormented with a species of louse (Oniscus ceti L.), peculiar to itself, which

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and later confirmed by Olrik and Ellberg, who have forwarded specimens, used as the basis for the preceding description, we have a definite statement, that they were taken from a Balaena mysticetus. We are informed by Martens and Mandt about where upon the skin of this rightwhale they settle. It is plausible, that the majority of the previous authors, who described the whale louse under the general name of "Oniscus ceti" or a similar name, were talking about the parasites of this bowhead, although this is not always stated in their descriptions with any certainty, since there is a much greater probability, that exactly this species would be collected and brought to the collections and zoologists, than the case would be with other Scandinavian species living on whales, which had never been the object of such an extensive and planned hunt, or of the southern whale-species, whose hosts only in the recent years became objects for similar endeavours. Therefore, I do not have any doubt, that the above-mentioned synonymy, which I have limited to the truly original descriptions or drawings^{*)} are basically accurate. Since, as developed

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adheres so strongly to the skin, that it will sooner be torn asunder than be compelled to let go its hold. The fins, the lips, the genitalia, and other parts of the body most protected from friction, are the parts most often infested with the parasitical insects. The bite is extremely painful, and they are most troublesome in the season, when the whale is in heat."

*) Often another drawing by Leach is cited from "Suplem. Encycl. Brittan." (plate 21). I had an opportunity to examine this work; but in my possession I have a copy of the same author's "A general arrangement of the classes Crustacea, Myriaroda, and Arachnides" etc. (Linnean Transactions Vol. XI),

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are basically accurate. Since, as developed above, it is not known with certainty, whether the "Oniscus ceti" of Linné is truly the species living on the bowhead, I have considered it proper to omit the special name /p. 28/ "ceti", in order to avoid a duality, or rather a multiplicity in meaning, that this has caused. This special name has been little by little given to not less than four different species. To call in the future the species of the bowhead - "mysticeti", instead of "ceti" is after all such a small and reasonable change, that I hope it will be approved by the zoologists ^{*)}.

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a copy once sent to Schweigger by its author contains an appendix of 7 plates with engraved pictures of arthropoda, which I assume belong to the above-mentioned "Supplem. Encycl. Brittan.". On the first of these plates bearing a subscriptum: Larunda ceti, drawings of a male and female (from above and below) of Cyamus mysticeti are presented recognizeably, though not very well. In order to have all the recognizeable illustrations of the Cyamus - species, I didn't want here to omit the latter drawings, regardless of it being rather unimportant.

*) The fact that I cannot accept the accuracy of Dr. A. Brandt's reasoning, by force of which he repudiates this proposal, I consider it superfluous to give further reasons.

It has already been mentioned that the other North-Atlantic rightwhale: the "Nordkap" whale or the "Sard" (Balaena glacialis or biscayensis) also is feeding, or has fed a species of this genus, about which nothing else is known.

2. Cyamus monodontis Ltk.

(Plate I, fig. 2)

distinguitur a C. mysticeti, cui valde affinis, statura minore, branchiis brevioribus, caput haud superantibus, cornu interno appendicum branchialium primi paris marium obsoleto, manibus pedum primi paris in faeminis fere edentulis, antennis brevioribus.

Size: Male 11 millimeters long, $5\frac{1}{2}$ millimeters wide; Female : 8 millimeters long, $4\frac{1}{2}$ millimeters wide.

Habitat: on the narwhal (Monodon monoceros) both and particularly upon the body and tail, and around the tusk of the male, together with C. nodosus m.

This species is so close to C. mysticeti, that it is superfluous to describe it in all its details: the shape of the body and the general appearance of the animal (its habitus) are completely the same as in the mentioned species; only by careful comparison one may convince oneself that there are permanent differences between them; it will be sufficient to state these differences.

First: the size; among a considerable number of specimens the largest male is not larger than the largest females of the bowhead whale's whale-lice - 11 millimeters long and $5\frac{1}{2}$ millimeters wide - and the largest females are only 8 millimeters long and

$4\frac{1}{2}$ millimeters wide.

Secondly, the gills are shorter: in an adult male the first pair reaches, at the most, to the end of the head, the second pair - only to the latter's base. Thus the relation here is almost as in the female of C. mysticeti, with which the male of C. monodontis also corresponds in size. In the female of this species the first pair of gills, on the other hand, reaches only to the middle of the head, and the second pair - somewhere along the second body segment, or, at the most, to the head. The tooth on the male's first leg-pair is small, but, nevertheless, it is distinct. The gill-appendices appear similarly, as in C. mysticeti, but the interior horn on the front pair is reduced to a small spine or nodule, or is even completely absent. On the underside of the body are found four spines under the seventh segment, 4 (6) under the sixth, but none under the fifth, they always appear at the same places and sufficiently distinctly in the equally large specimens of C. mysticeti. In females of C. monodontis we find on the ventral side of the third and fourth segments, besides the egg-plates, a simple (half) gill-appendix shaped as a pointed nodule or a thick spine on either side. On the fifth segment, we find a nodule on either side of the vulva. On the sixth segment, we find 4 (6) spines, and on the seventh-two. The hand of the first pair of legs has, at the most, has mere traces of a tooth, often not even that much. Furthermore, it must be stated, that the upper antennae of this species reach at the most, slightly along the second body segment, when they are bent to the rear. Incidentally, the shape of the antennae varies much in males, where they sometimes are long and delicate as in females, and sometimes remarkably short and thick. The spines on the hips of the rear-legs are as distinct as in C. mysticeti.

In smaller males (5 millimeters in length) the just-mentioned tooth on the hand of the first pair of legs, disappears, and the rear gill-appendices, like the front ones, form only one set of horns. The females of equal size have already traces of egg-plates, and might furthermore be known from the males by the third and the fourth body segment being not less developed than the other segments, as in males.

When the size is 4 millimeters, the gill-appendices disappear and exterior sex-difference is not detectable; and at a still younger age (2 millimeters), they have the appearance common for the juveniles of the genus, - almost spherical, sac-like gills, etc., and are hardly discernable from juveniles of other species of the whale-lice.

Numerous shipments of the whale-lice of the narwhal from the state councillor Olrik, District medical officer Pfaff, Colony manager Fleischer and several others, all have supplied a rather valuable material on this species, which habitates the narwhal together with C. nodosus. Analogously with Roussel de Vauzème's observations, according to which various Cyamus - species of the southern whale (at least some of them), attach themselves to various regions of the whale's surface, - there could be a certain possibility, that C. nodosus and C. monodontis neither did live together on the narwhal. This assumption is strengthened by the evidence, that among a considerable number of specimens, which Olrik and Fleischer gathered from the base of this animal's tusk, from different individuals and at different times, there was not a single C. monodontis, but C. nodosus exclusively. On the other hand, whale-lice collected by Pfaff on various places of a narwhal's flippers, body, and tail, all turned out

to be C. monodontis; the latter species is often sent alone, as taken from narwhal, but without any further indication of from where upon the latter's body they were collected. One sender (Colony-manager Andersen) stated definitely, that the C. nodosus sent by him occurred exclusively at the tooth base of the narwhal. I believed therefore for a long period of time, that C. nodosus occurred exclusively at that spot, i.e. at the base of the narwhal-male's long tusk, thus only in one of the sexes, and that C. monodontis, on the other hand, occurred at other places of the body and, probably, in both sexes. Experience of the recent years have, however, forced me to give up this assumption. In 1863, Mr. Fleischer had sent me a jar with 2 Cyami with a label stating that they were taken from a narwhal "at the teeth"; the jar contained one specimen of either species! As a result of this, a request was sent to Mr. F. to supply information concerning this phenomenon. The answer came in 1865 together with a jar of whale-lice taken at the base of a narwhal's tusk, and another jar with parasites taken from its body. The first jar contained C. nodosus in hundreds, /p.30/ but among them were, however, three specimens of C. monodontis. The second jar contained a considerable amount of C. monodontis, among which there were at least six C. nodosus (here I consider only those specimens, which were sufficiently developed to make their determination easy, not juveniles). He sent two jars also in 1866. One jar with "tooth parasites of the narwhal": both species in approximately equal numbers; the second jar containing "tail and body parasites": mostly of C. monodontis, but a considerable number of C. nodosus. Among a couple of hundreds of cyamids "from the base of the tusk", which Pfaff had sent in 1863, there were 7 C. monodontis, the

remainder was C. nodosus. The result of the above, at the most, may be, that C. monodontis occur predominantly on the body and tail of a narwhal, while C. nodosus, predominantly at the base of the tusk. However, none of these species is limited by this distribution, but both may appear mixed with each other. Both species seem to be common, i.e. are present in considerable numbers upon the whales infested by them, but whether all or the majority of the narwhals, or merely a few individuals, are infested by these parasites is unknown to me ^{x)}.

x) Several authors familiar with the nature of the Arctic Sea, knew the whale-lice of narwhals. For example O'Reilly (l.c. page 196) says: "the edge of the fleshy covering, embracing the root of the Monodon's tooth was covered with insects of the same description". (Oniscus ceti); Scoresby: (l.c. page 343): "Oniscus ceti : "A similar animal, but smaller, is sometimes found on the body of the narwhal.) Dewhurst (l.c. page 259): "The narwhal is liable to the annoyance of a similar but smaller animal." That O'Reilly probably means C. nodosus, Scoresby, probably C. monodontis, is at least probable.

Many naturalists, who have difficulty in understanding how a species is capable of being changed into another through "changed living-conditions", might perhaps accept this thought in the case of closely related parasites. Why shouldn't the same parasites live on the bowhead or on the narwhal, and in addition to this have the same geographical distribution, as the true Arctic Sea animals? What should be closer than accepting that C. monodontis is one of the narwhal's peculiar dwarf-form of C. mysticeti, originated by the latter's accidental transfer to the narwhal, or the opposite, - that C. mysticeti is a higher and more complete form of C. monodontis, originated by the latter's transfer to the rightwhale? Something of this kind is naturally very possible, but this possibility or probability must, however, not lead to having one of the species recorded as a sub-species of the other one, thus misunderstanding their specific independence.

3. Cyamus Kessleri Brandt.

(Plate II, fig. 3).

Distinguitur a C. mysticeti praecipue corpore angustiore, antennis superiobus brevioribus, caput longitudine aequantibus, branchiis (simplicibus) in utroque sexu caput longe superantibus, appendicibus branchialibus marium, spina ventrali horizontali suffultis, bicornibus, /p. 259/ elongatis, filiformibus fere, cornibus anterioribus nonnihil brevioribus, faeminarum simplicibus brevioribus, anterioribus crassis, posterioribus tenuibus, manibus

pedum primi paris fere vel plane edentulis, secundi paris bidentalis, dentibus approximatis, anteriori brevior, annulis corporis posterioribus subtus inermibus, solo annulo penultimo faeminae tuberculis quatuor armato.

Size: the male is 12 millimeters long and 5 millimeters wide; the female: 10 millimeters long and 5 millimeters wide^{*)}.

Habitat: "habitat in Sinu Metchigmensi, Maris Beringii, in Balaenis" (Br.).

Citat: (1872) Alex. Brandt: "Bericht über die Cyamiden des zoologischen Museums der Kaiserlichen Academie der Wissenschaften zu St. Petersburg" (Bulletin, volume XVIII, page 113 - 133)^{*)} (Cyamus Kessleri, c. fig. xylogr.).

As I only had opportunity to study one single pair of this species, (for which I am grateful to the kindness of Dr. Brandt), it is possible, that in the

*) The largest specimens of the St. Petersburg Museum are slightly larger: Male: 14 millimeters long and 5½ millimeters wide; Female: 11 millimeters long and 5½ millimeters wide.

*) This work was brought to my attention only in the beginning of the year, long after this paper being presented to the Society of Sciences and forwarded to the printers. This work contains in addition to the descriptions and drawings of the above-mentioned species, also some aphoristic remarks on other species known to the author (which the St. Petersburg Museum, in majority of cases, received from here through me), and particularly it discusses the "ontophylogenic" interrelation of these species and their probably place in the chain of evolution.

subsequent description I was unable fully to discern, what was merely individual distinction, and what was special features. Therefore, I must refer the reader in addition to the short description below, also to a somewhat more complete presentation by Dr. Brandt. The species is, however, easily distinguished from all the known Cyamus-species by a number of distinct features, and it is particularly well distinguished from C. mysticeti, which is probably the closest related species.

Description of a Male. The body shape is rather narrow and elongated. The greatest width is less than one half of the total length, the clefts between the body segments are very narrow, so that the segments press almost direct against each other. The second body segment is not of any extreme size; there is nothing noteworthy neither in its shape, nor in the shape of the two following (gill-carrying) segments, except that these are generally poorly developed and their rear lateral corners run out in a nodule ^{*)} bent downwards and forwards, which appears behind the attachment of the gills and of the gill-appendices.

*) Taking this nodule for a gill-appendix, Dr. A. Brandt ascribed to this species triple gill-appendices. A comparison with features in other species, will probably indicate, that this assumption is not completely correct.

The three rear body segments run along each side into a smaller, round nodule in front of the attachment points of the legs. The antennae are short, not longer than the head, but of a rather strong built. The bottom corner of the hand of the first pair of legs protrudes, but it is hardly a true tooth. The second leg pair's two teeth are placed rather close together (just as in C. ovalis), but here the front one is short and chubby, the rear one longer and more pointed. The gills are thick and long (twice as long as the width of the body, but shorter than the total length), they both reach far beyond the antenna points.

The gill-appendices are double and both horns are prolonged/p.32/ and almost thread-formed; the front(interior) horn is, however somewhat shorter than the thin; rear one. On the other hand, there is no really noticeable difference between the first and the second pair; at their base, ^{x)} find a horizontal conical nodule or spine on each side. But one does not see any spines on the ventral side of the subsequent three joints; the three pairs of rear legs are slim, but not too compressed; the thickened rear margin of the hips does not exactly form a spine, but still a distinct nodule.

x) This formation could cause suspicion, that a very similar spine situated at the same point in several species (for example: C. globicirritis, C. nodosus and Platycyamus Thompsoni), perhaps is not, as I have assumed in the subsequent description, representing the gill-appendices, or a branch of the latter.

The female has relatively as long gills as the male (their length equals the body length measured from the second body segment), the hand of the first pair of legs is slim, without protruding corners. The gill-carrying segments are not weaker than the subsequent segments, and without folded rear-corners. The gill-appendices are present, but single. They are shorter than in the males, but longer than the ones ordinarily occurring in females, the front one is thick, and the rear one is thin. On the bottom side of the second-last body segment are four conical nodules.

According to information given by Dr. Brandt, to whom the credit for the introduction of this species into the science must be given, the specimens of the St. Petersburg Museum "belong to the late and highly distinguished curator of the above-mentioned museum, E. Wosnessensky, who was a travelling zoological collector", and who, in 1846, removed these specimens from a whale "in the Metschigmsky Bay, at the extreme eastern point of Asia, close to the Strait of Bering." There is reason to assume, that this whale was of the species called "the little Kulema", and which according to the description given by the Aleutians^{*)}, must be closely related to B. australis and glacialis.

*) Chamisso: Cetaceorum maris Kamtschati imagines ab Aleutis e ligno fictas, plate XVII, figure III.

4. Cyamus erraticus Rouss. d. Vauz.

(Plate III, fig. 5).

Distinguitur a C. mysticeto branchiis (simplicibus) longissimis, gracilibus, acutis, in utroque sexu caput superantibus, in maribus totum corpus cum capite aequantibus vel illis longioribus; appendicibus branchialibus in maribus bicornibus, cornubus fere aequalibus, in faeminis simplicibus dentatis; antennis superioribus, marium praecipue, longis validisque.

Colour: wine-red (Roussel de Vauzème).

Size: Male: 12 millimeters long, $5\frac{1}{2}$ millimeters wide; Female: 10 millimeters long, 5 millimeters wide.

Habitat: on the southern whale (Balaena australis) "upon the smooth parts of its skin, on the head, at the base of the horn-like nodules, on the fins, but particularly in the opercula, below the opercula, and in the folds around the anus and the genitalia; more mobile - less stabile - than C. ovalis and C. gracilis (Rouss. de Vauz.).

Synonyms and Quotations:

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(1834). Roussell de Vauzème l.c. page 259, plate VIII, fig. 20 - 23 (C. erraticus).

(1840). Milne Edwards: "Hist. nat. d. Crustacés" volume III, page 113 (with exclusion of all the synonyms except the last one) (C. erraticus).

(1842-1843). Krøyer: Fourth volume, page 479; Plate V, fig. 71 - 76 (C. erraticus).

(1843). Krauss: "Die südafrikanischen Crustaceen", page 61 with exclusion of the quotation of Desmarest (C. mysticeti C. erraticus, "from a whale caught in Tafelbay, but less frequent upon this than C. ovalis").

(1862). Spence Bate: "Catal. of Amphip." page 368 (C. erraticus); The diagnoses, however, are completely wrong).

Description of a Male "from the Southern Sea" ^{x)}

The length is 9 millimeters, and the width - $4\frac{1}{2}$ millimeters. The body shape is oval, rather flat, the third and the fourth body segments are slightly smaller (shorter) than the other segments, just as in C. ovalis, mysticeti, etc. The upper antennae are strong and long, when laid back reaching the fourth body segment.

x) Unfortunately there is no further information as from what part of the "Southern Sea" this specimen comes from. In vain I looked for C. erraticus upon the large pieces of skin (of Balaena japonica ?), which were covered with numerous cyamids (C. ovalis and C. ovalis, and which previously were available in the university's physiological museum, and which I will discuss again later. Since it appears that it lives mostly apart, and does not mix itself with the other two species, there was no real chance to find it there.

The first body segment runs into a small down-turned spine or nodule on either side at the base of the first pair of legs. The second body segment runs into three small round nodules (the two of them on its front margin and one at the latter's lateral corner, the third in the rear corner), the third and the fourth body segments run into one each. The hand of the first leg pair is broad, with two indistinct teeth, those of the second leg-pair has strong teeth separated by a deep cleft. The gills are simple, thin, and pointed, very long (10 millimeters), longer than the entire animal, the gill-appendices are bicornate, with the two pointed horns equally developed. The rear legs are strong and compressed, with long claws; the hips have underneath each a strong spine, just as in C. mysticeti. On the ventral side of each of the last three body segments there are two strong spines, upon the second-last (sixth) segment- also traces of a pair very small spines located behind the larger ones.

Besides the above-described specimen and the specimens presented in the two furthestmost figures (plate III, fig. 5), I had an opportunity to study another somewhat larger specimen (12 millimeters long, $5\frac{1}{2}$ millimeters wide, the gills - $12\frac{1}{2}$ millimeters) (as indicated by the Paris Museum : "from Cayenne" ^{*)}), the habitus of which is somewhat better

*) This place indication is rather noteworthy, since it is unknown, whether the southern whale ever reaches such a low latitude; I can only present it the way I had received it myself. However, I have no reason to doubt, that the Cyami described here are of the same species as Roussel's C. erraticus. My material on this species is not as good and plentiful, as desired, however, I believe to have presented all the information I was able to obtain.

the habitus of which is somewhat better in agreement with the drawing of Roussell, since the body-segments are separated by wide intervals; otherwise I find no material difference, except that there are four spines on the fifth body-segment, but these spines are completely rudimentary, /r.2 which could have been both individual, and an age difference. The specimens are shown in fig. 5 ♂. The matching females distinguish themselves neither in size, not character from the below described.

Female (according to a specimen from Tafelbay, information from Prof. Krauss); the size is indicated above. The antennae are somewhat finer and shorter, and reach the third body-segment. The third and the fourth body-segments are of fully identical size as the subsequent segments. The gills are shorter (7 millimeters); both pairs, however, reach beyond the point of the head. The "teeth" on the hand of the second pair of legs are weaker than in a male, and the first lower nodule is not distinctly developed. Between the base of each gill and the egg-plates we see a single, short, flat, indented gill-appendix. The spines on the ventral side of the body and on the rear legs are similar to the ones of the male, but all are very large and well-developed, even to a higher degree than in a male. The smaller pair of spines behind the larger one on the second-last segment is relatively better developed.

As far as I can see from a quotation from Spence Bate and Westwood ("British Crustacea", page 86) Gosse

has ("Mar. Zool. I, page 131") quoted C. erraticus as an English species, probably without reason. The mentioned authors, just as Milne-Edwards, have committed the error already corrected by Krøyer of uniting this species with "C. ceti" (C. mysticeti m.).

6. Cyamus boopis Ltk.

(Plate III, fig. 6)

Differt a C. erratico, cui maxime affinis, praecipue corpore graciliore, annulisque ejusdem in maribus incisuris majoribus sejunctis, branchiis brevioribus longitudinem corporis haud aequantibus, antennis marium latioribus.

Size: the males: 11-12 millimeters long, 4-5 millimeters wide; the females: 7-8 millimeters long and 3 - 3½ millimeters wide.

Habitat: upon the Scandinavian humpback whale or the Krepokak (Megaptera boops), whether they also occur upon other Megaptera - species is still to be investigated.

Synonym:

(1780). O. Fabricius: "Fauna Grönlandica" page 253, number 230 ("Oniscus boops accepti in Balaena boops"; Oniscus ceti). (The description is actually not given; one refers to the description by Pallas (of C. mysticeti m) and only gives some remarks concerning the colour^{*}) and habitat.

* O. Fabricius indicates the colour as : "brown on the front half of the body, and white on the rear one". If this indication is taken from a dry specimen /which is not improbable/, this statement is naturally without any

and the information that the head is narrower than Pallas represents it, and that the rear legs are "two-spined" (femora postica biaculeata"), which is not correct). /p. 263

Description of a male. The shape is rather slim, slimmer than of C. erraticus, which is the one of the described species, that it resembles most: the body-segments are still further separated from each other, than in the above-described male of that species. The head is very narrow and elongated and the first body-segment runs, also here, out into a small nodule above the base of the first pair of legs; the second body-segment, which is rather small, also has two rounded small nodules on the front margin on either side and a larger one in the rear lateral corner. The third and the fourth segments are widely separated, they are shorter, but not narrower than the fifth and the sixth segments; their rear lateral corners form, also here, a round nodule. The upper antennae are of a very powerful built, the two interior joints are particularly noteworthy for their width. Where the interior joint is widest, it is not much narrower than the head. Laid rearwards these antennae

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importance. Fabricius left manuscripts ("Zoological collections or animal descriptions", Large Royal Library, New Royal Collection, No. 322) in which he gives further information. He says, in First book, page 64 : "Upon this whale (humpback whale, Balaena boops) is found some kind of "fish bear (TR:?)", which attaches itself by sucking into the skin, or attaches itself with its large claws, neither of which methods could possibly be pleasant to the whale.

rearwards these antennae would reach the third body-segment, or even somewhat further, thus they are slightly shorter than in C. erraticus. The gills are long - 7 - 8 millimeters in the larger specimens, $2/3$ of the total length, and in fully adult specimens both pairs reach beyond the head, but not as in C. erraticus (whose gills they otherwise resemble in shape) beyond the upper antennae. All the gill-appendices are bi-cornate and both horns are almost equally developed, just as in C. erraticus, but otherwise have somewhat varying dimensions in various individuals, though always relatively smaller than in the mentioned South-Sea - species. The tooth on the hand of the first pair of legs is wide with a distinct nodule or tooth. The second pair has two widely-separated teeth, of which the upper (external) one is pointed, the bottom (interior) one is rather small; its hips run forwards, just as in C. erraticus and in several other species, into a plate-shaped prolongation, which is clefted in a larger rounded interior, and a smaller pointed exterior nodule. There is one spine below the hip on the three pairs of rear legs and two small ones (smaller than in C. erraticus) on the ventral side of the sixth and seventh segments, but none on the fifth. On the third-last joint of the three last pairs of legs the exterior rear corner forms a much more distinct point or spine than in C. erraticus, where it forms only a more or less protruding corner.

Younger males have still slimmer body and appendages, shorter gills and antennae, and no gill-appendices, or have only the one (the rear) horn of the latter, depending on

their age; they have one more pair of spines on the ventral side of the fifth segment, which disappear later.

The female is considerably smaller than the male, and different from the latter in many respects. Thus the third and the fourth body segments are not smaller than the subsequent segments, neither is their shape noticeably different from the latter. The clefts between the body segments are narrower, thus these appear to be less separated from each other, the gills are shorter ($4\frac{1}{2}$ millimeters in length in the largest females, whose dimensions are stated above and reach only to the point of the head (the rear ones), or slightly above the latter (the front ones), the antennae are finer (but still of a rather powerful built) and furthermore slightly shorter (they reach approximately to the third body segment). The teeth on the hand of the second pair of legs are not very distinct, in particular the exterior one is noticeably poorly developed in comparison, with the same in the male. The spines on the ventral side are very distinct, relatively better developed than in the males, but otherwise arranged in the same manner as in the latter, except that there also is a very distinct pair on the fifth body-segment, i.e. six in total. At the base of each gill there is a half gill-appendix of a similar shape as in C. erraticus, but without dents in the margin.

Specimens with express indication that they come from the humpback whale (Megaptera boops), were forwarded to us by state councillor Olrik, captain Hammer, district-administrator Smith, and practicing medical doctor (former ship-doctor) Hallas.

Furthermore, I found such specimens myself sitting between the Coronula diadema upon the skin of this whale, and I assume, that in general, C. boopis is a rather constant parasite on the krepokak. Fabricius indicates, that they occur particularly "near the flippers, ears (!), navel, and genitalia." The district administrator Smith writes that they were found "everywhere upon the whale"; Mr. Hallas has on the other hand, informed me, that on a humpback whale, caught in Myrebugt Bay near Iceland, in the summer of 1867, he found at closer study these whale-lice in the wrinkles at the base of the coronulae, but only upon the tail-fin ^{*)}, and not on other parts of the whale's skin, where the mentioned balanids were attached (exterior margin of the flipper, the ventral folds, around the anus, etc.).

No matter how close C. boopis stands in all its basic features to C. erraticus, and how little weight the zoologists of the new school perhaps would ascribe to the stressed small differences, which in specimens younger than described here could hardly be reliable. The circumstances that one of them lives on the southern whale and the other on the Scandinavian humpback whale, should strongly support the belief that they are two distinct species.

I am, however, still more in doubt in respect to some cyamids living on unknown whales in the tropical part of the Pacific Ocean, which I am now going to discuss, since I do not consider it proper to bypass them in silence. However, I have not reached full clarity concerning them.

* See "Videnskabel. Medd fra den naturhist. Forening" /Scientific Reports of the naturalistic society/, 1857, page 176

? Cyamus pacificus LTK.

(Plate III, fig. 7).

Differe videtur a *C. boopi*, cui figura, spinis coxalibus inferiorioribus etc. maxime affinis, branchiis nonnihil longioribus, spinis anguli externi postici articuli tertii pedum posteriorum (V-VII) marium indistinctis, ventralibus faeminarum longioribus.

Size: the male is 9 millimeters long and 3 millimeters wide; the female is 7 millimeters long and 3 millimeters wide.

Variation: Sp. Bate: "Catalogue of Amphipod. Crustac." page 366, plate 58, fig. 2 (Cyamus ceti) (according to an approximately 8 millimeters long male specimen from "Talcahuna" in the Paris-Museum) ^{*)}.

*) I had opportunity to compare this original specimen with the one by Sp. Bate (very arbitrarily) as "*C. ceti*" represented species, which was kindly forwarded me for this purpose. The picture of Sp. Bates is unfortunate. From my typical *C. pacificus* it distinguishes actually only by being slightly narrower (Length: $8\frac{1}{2}$ millimeters, width: $2\frac{1}{2}$ millimeters), gills shorter ($5\frac{1}{2}$ millimeters, they do not reach to the antennae points), the gill-appendices are extremely small, and the third and fourth body segment is without distinct lateral nodules. Temporarily I classify it as a variety of *C. pacificus*; fortunately, it is actually nameless, since the name *C. ceti* cannot rightly belong to it; but before we can be determine on what whale-species it and the true *C. pacificus* m. live, their mutual relation cannot be finally settled.

Habitat: on whales (of unknown genus and species)
in the Pacific Ocean, at the American side (Panama, Talcahuano ?)

I am forced, - at least temporarily, - to set up this species on the basis of two specimens, a male and a female "from Panama", which I owe to the Museum in Paris and in particular to Dr. Alphonse Milne-Edwards. When comparing the male with the male C. boopis, one will find, that in its habitus, in all its general form-conditions, it is extremely close to the Scandinavian species; furthermore one will find that its gills are still longer, they reach above the point of the outstretched upper antennae, and in general are not much shorter than the total length of the body, that the spines in the exterior rear corner of the medium (third-last) joint of the three last pairs of legs is less distinct, and the hand-nodule of the second pair of legs is slightly more developed. The female deviates from the corresponding form of C. boopis, in particular by having the three last pairs of legs slimmer, and the spines on the ventral side of the body segments, in particular of the two last ones, are longer. The spines in the exterior rear corner of the third-last joint of the rear-legs is, on the other hand, here as distinct as in females of C. boopis, and both nodules on the hand of the second pair of legs are slightly more developed than in the variation in question.

Compared with C. erraticus the differences appear to be the following: the male C. pacificus has a slimmer built, wider cleft between the body segments, somewhat broader antennae, shorter gills, smaller gill-appendices, and no traces

at all of the spines on the ventral side of the fifth body segment. The female has a narrower body, slimmer rear legs, somewhat shorter gills, six ventral spines instead of eight, and distinct spine points in the rear corner of the third-last joint of the rear legs. Further comparison, set up on the basis of greater material, is completely necessary to delineate the limits between these species.

As long as one does not know the species of the whale that breeds "C. pacificus", we lack a material momentum in its determination. It is perhaps more natural to classify it of geographical reasons, as belonging to C. erraticus, but in other respects it is closer to C. boopis. Maybe this is the unknown whale-louse of the sperm-whale? Or is it perhaps taken from a Megaptera-species in the Pacific Ocean? The experience that a Coronula-species, belonging to the Cape Museum, thus probably originating from a southern whale-species, without doubt, a Megaptera, cannot be distinguished from C. diadema of the Scandinavian humpback-whale (Megaptera /n. boops) (see page 244, 49) encouraged me to consider it possible, that C. boopis might occur on the Pacific M...; C. pacificus and its variety (?) from Talcahuano could then merely be understood as forms of Scandinavian species? I was pushed further towards this thought by two young cyamid males from "Museum Godeffroy", which, without any further information, are recorded to be taken from a whale near the Tonga-islands (some still younger specimens from "Rarotonga, Cook Islands"), and which differ only by the somewhat longer rear legs from C. boopis of the same size. I do not find

any difference even in the brush arrangement of the last joint of the upper antennae. Unfortunately, I have not been able to compare them with younger specimens of C. erraticus ^{x)}. Admitting openly, that I have not attained any satisfactory answer in respect to this forms, I conclude their discussion by expressing my hope, that others will soon succeed in bringing forth abundant material with reliable indication of the host, thus elucidating, whether I am right in my belief, which is not completely taken out of the thin air, ^{/p. 26} that a whale-louse species lives on one or several of the Pacific humpback whales. These parasites cannot be specifically distinguished from a species living on the krepekak (C. boopis). Until the opposite is proved, I believe that "C. pacificus" m. is an independent form, specifically different from C. boopis and C. erraticus, but it forms a link between these two species.

x) In a small glass jar with whale-lice, which the previous University Museum had received without detailed information from the physiological museum (then still in existence), there was, besides a few specimens of C. gracilis and C. ovalis, some young specimens of a third species, which I previously (before "C. pacificus" was known to me) would have classified as C. boopis, without any further thought. The circumstances, that they were placed in a jar together with on "Balaena australis", would rather indicate, that they too came from this species, or, at least, from another South Sea or Pacific species. I was not able to accept them as juveniles of C. erraticus then this species and C. boopis could not be distinguished even as half-grown, and this I cannot accept, until I have obtained better proof thereof. Just as improbable would it be to assume

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it be to assume, that on the South Sea rightwhales (Balaena australis & sp. aff.) would live still a fourth species, until now unnoticed, or confused with C. erraticus (C. pacificus ?), - or maybe that this species replaces C. erraticus on certain forms of the South Sea rightwhales. To loose oneself in these guesses is, however, completely useless, and I myself add, the otherwise insignificant fact exclusively not to miss any opportunity, which possibly at other combinations might have lead to throwing some light over this problem.

In order not to lose any Ariadne thread, which might lead us out of the labyrinth of uncertainty, I have sought information concerning which species of whale is the object of catch near the coast of Chile, and professor Reinhardy was then so kind to inform me, that "in the bay where Talcahuano is situated, no regular whaling was ever carried out; it was on the contrary forbidden to whale there because the currents carried the de-blubbered whales onshore, where they used to lie and stink. But outside of the bay, along the shore, at the level with Concepcion and Talcahuano, still in the twenties and in the beginning of the thirties there were many whales and much whaling; especially there were many Southern Right-Whales, but the South Sea whalers also constantly took the Humpbacks (Megaptera) and the "Sulphur-bottoms" (true fin-whales), when they had opportunity." I will merely remind,

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that the Coronula, in which Eschricht thought to recognize the Scandinavian "Diadema balaenaris" (C. diadema) was taken by Krøyer near a beached whale-skeleton at the Chilean coast (see "Naturhistoriske Tidsskrift", IV, page 486). That E. was right, appears to us now still less unreasonable, after that we, as mentioned above, have received the true C. diadema from Cape. It is true, that the relation between the coronula and the whale is different from the relation between the latter and the whale-louse (which is a true parasite, which the coronula is not), therefore one cannot on the basis of the above-said draw any conclusion in either way; however, it seems, as discussed above, that there is a certain analogy in the dispersion circumstances of the whale-lice and the coronulae.

7. Cyamus ovalis Rouss. de Vauz.

Differt a *C. mysticeti*, cui forma similis, branchiis duplicibus, appendicibus, branchialibus faeminarum nullis, marium filiformibus, elongatis, anterioribus simplicibus, posterioribus bicornibus; dentibus pedum secundi paris approximatis, anteriori vulgo longiore; coxis pedum posteriorum subtus antice haud in spinas productis.

Colour: white (R. de V.).

Size: the male is 14 millimeters long, 7 millimeters wide; the female is 11 millimeters long and 6 millimeters wide.

Habitat: on nodules on the head of the Southern whale (*Balaena australis*) (R. de V.) and of the North Pacific rightwhale (*B. japonica* ?).

Synonyms and quotations:

(1834). Roussell de Vauzème: "Mémoire sur le *Cyamus ceti*" ("Annales des sciences naturelles, 2nd series. Zool" Vol. I, page 259, plate 8, fig. 1 - 21; *Cyamus ovalis*).

(1835). Milne-Edwards: "Observations sur les changements de forme" etc. (Annales des sciences naturelles", 2nd series, Zool. Vol. III, plate 14, fig. 13-14; *Cyame ovale*). (Adult female and a juvenile from the breeding sac).

Guérin-Ménéville, "Iconographie" etc. "Crustacés", plate 28, fig. 4 (male) and 4a (juvenile); (the latter is a copy of Milne-Edwards, l.c. fig. 14; the other figures are from Roussell de Vauzème). (*Cyamus ovalis*).

(1840). Milne-Edwards: "Histoire naturelle des Crustacés", Vol. III, page 113 (Cyamus ovalis).

Milne-Edwards: "Cuvier, le Règne animal", grande édition illustrée ("Crochard"), Crustacés, plate 63, fig. 3.

(1843). F. Krauss: "Die sudafrikanischen Crustaceen", page 61 (C. ovalis, from a whale killed in Tafel-Bay; no description; the size is 6 lines (.6 of an inch); "much more frequent than C. erraticus").

(1857). White: "A popular history of British Crustacea", page 219 (Cyamus ovalis).

(1862). Spence Bate: "Catalogue of the specimens of Amphipodous Crustacea in the collection of the British Museum", page 367, plate 58, fig. 3 (after a specimen from Cape in the Paris-Museum) (C. ovalis).

(1866). Spence Bate and Westwood: "A history of British sessile-eyed Crustacea", page 91 (fig. 1) (male and female; copies of Roussell de Vauzème; description also east of the foreign sources).

(1871). Alex. Brandt: "Ueber die Haut der nordischen Seekuh (Rhytina borealis III.)" ("Mémoires de l'académie impériale des sciences de St. Pétersbourg", VII series, volume XVII No. 7), page 17 - 23, plate figure 17-19, (Cyamus Rhytinae) (see: same author's "Bericht über die Cyamiden" etc. page 688 - 690: C. ovalis).

Description of the male: The largest available specimens are 14 millimeters long and 7 millimeters wide. The body shape resembles much C. mysticeti; however, the second body-segment is relatively longer and is divided into two humped lateral portions by means of a longitudinal

groove and a deep cleft into the strongly curved front margin. This segment runs in each lateral corner into a distinct nodule, just as in the mentioned species of the bowhead. The upper antennae are approximately as long as the second body segment is wide, and reach, when bent rearwards, to the third body segment. The third and the fourth body segments are identical to those of C. mysticeti and of the other until now described species, somewhat weaker than the subsequent segments. The third body segment runs on either side, both in front, and in the rear into a distinct nodule, the fourth body segments runs that way only in the rear. All the legs are much stronger compressed than in C. mysticeti, the margin between their two planes are therefore much sharper. The "tooth" on the hand of the first pair of legs is more or less distinct; the hand of the second pair of legs is very large, its two "teeth" are very protruding and placed closer to each other than, for example, in C. mysticeti, the exterior point is rather long, the interior very chubby and in most cases rather short, the hips of the rear legs run to the front into a plate with protruding corners and thickened exterior margin ^{*)}, but not, as in all the until now described species, - into a spine; however, there is a small nodule on the underside of the two last pairs ^{**)} of the rear-hips. The legs are generally much more

*) It is this exterior margin, which in C. mysticeti runs into a spine in the front; actually it is only a difference of degree, but it is noticeable enough.

**) Roussell de Vauzème draws a third pair to be on the fifth pair of legs in the female: I have not seen a such.

mobile than in C. mysticeti and could be turned around with great ease. The turning takes place between the second and the third joint. The underside of each of the two last body segments may have four very small (often completely indistinct) nodules. The gills are long, thin, filiform, and nodule, i.e. where in other species we find only one gill, here we find two, which at their base hang together and continue into each other; the upper branch is much longer than the lower. The longer branch of the first pair reaches above the head, the one of the second pair - to the end of the latter. The gill-appendices are long and thin (almost as long as the third and the fourth body segments together); there is one of such gill-appendices at the base of the front gills, while at the base of the rear ones we find two such gill-appendices.

A younger male (8 millimeters long and $3\frac{1}{2}$ millimeters wide) has shorter gills; the gills are only as long as the body width.

The largest available female is 11 millimeters long and 6 millimeters wide, in other words the largest of the females of C. mysticeti, thus relatively (in relation to the males) larger than in the latter species. The females differ from the males (in addition to the parts which are in direct service of the procreation of the species) only in the following points: the gill-carrying body segments are rather larger (longer) than the fifth body segment. Only the third front lateral corner is developed in these segment nodules. The gills are identical to the ones of the males, but shorter: the longer branch of the first pair reaches

at the utmost to the end of the head, the one of the second pair - to the base of the latter. The gill-appendices lack completely. The hand of the first pair has, also here, a more or less indistinct tooth, and the spines on the underside of the two last body segments are more distinct than in males.

Although the short description of White ^{★)} of his C. ovalis suits completely to this frequent parasite of the southern whale, one cannot without further proof accept, that this species is truly taken from a species beached at England's coasts (a species, which does not occur often), this being the true Balaena australis or not. White says nothing about his source to this noteworthy collection of these parasites from the southern whale in the European fauna. Spencer Bate, who bases himself on White alone, would probably had done better, if he had omitted this species in his work on English recent-crustacea, where its inclusion will undoubtedly cause further ^{★★)} misunderstandings.

★) "Body much wider than in C. ceti; four pairs of branchial appendages in both sexes, those of third ring with a single short slender appendage at the base, those of the fourth ring with two of unequal length; lives in clusters on the hard projections of head of whale".

★★) Thus Alex. Brandt (l.c. page 20) mentions, without any further comments C. ovalis, as a species occurring on whales near "the British coasts".

Original specimens are found in the "British Museum" of C. abbreviatus described by Say ^{★)}, taken from undetermined "Balaena", unknown where; according to these specimens Spence Bate gave ^{★★)} a new description and drawing. Spence Bate adds, that it looks to him as a juvenile of C. ovalis. Under any conditions, it appears that one may now definitively dispense of the species of Say from the number of reliable and recognizable species.

Roussell de Vauzème must be credited with the information that C. ovalis lives together with C. gracilis on the Balaena australis' cartilaginous nodules formed by epidermis upon the chin, lips, and the upper-jaw, but particularly near the spoutholes. The balanea of the Tubicinella - genus attach themselves at the above-mentioned places, and the whale-lice in their turn, congregate around them, in such quantities, that the whale's head appears white even from a long distance, when the whale raises it above surface. Just as C. gracilis, which is easily discernible from C. ovalis owing to its clear yellow colour, it does not leave the horny nodules on the head of the whale.

★) Journal of the academy of natural sciences of Philadelphia. Vol. I, pt. 2, page 392.

★★) Catalogue of Amphipod. Crust. page 367, plate 58, fig. 4.

The whales, from which R. de V. had taken his cyamids, came from the southern part of the Atlantic Ocean, between the Falkland-Islands and the Tristan d'Acunha, and also from whales beached in Tafelbay, from which Krauss got his specimens, all have probably been the true Balaena australis. The same applies to the whales "from near Patagonia", a few parasites from which (C. ovalis and gracilis) Dr. Packard was so kind to send me. Likewise the parasites, which Dr. Møller brought professor Krøyer^{★)} from the first voyage of the Danish whaler-vessel "Concordia", could probably come from the same true southern whale (or from Balaena antipodarum, if they, just as the Coronulae, which the same ship-doctor had presented to Eschricht^{★★)}, are collected near New Zealand). On the other hand, the "excellent beautiful portions" of the "crown" of the southern whale containing both Tubicinellae and cyamids (C. ovalis and glacilis), which previously were kept in the Physiological Museum, and which according to the statement of Eschricht (l.c.) are from waters around Kamchatka, - are B. japonica beyond doubt. The same also applies, in the below discussed, specimens collected by Wosnessensky same place, and concerning whose complete identity with C. ovalis R.V., I have not the least doubt. I had the opportunity myself to study many or few specimens

★) Naturhist. Tidskrift /Journal of Natural History/, Vol. IV, page 475.

★★) . Studies on whale animals. I (Science Society's Publications, Mathematical-Branch - XI) page 150 and 151.

from all the above-mentioned areas of distribution :
 from Cape, from Patagonia, New Zealand, and Kamchatka,
 i.e. from the seas in farther or closer proximity to
 these points, but I did not discover any difference between
 them. Thus we stand here facing two alternatives: either
 this must be the same whale-species, which occurs on both
 sides of the line in the Pacific Ocean, and in the southern
 portion of the Atlantic Ocean: the Cape, Patagonia, New
 Zealand, and near Kamchatka; or C. ovalis which, like
Tubicinella balaenaris, live upon the rightwhale occurring
 both in the southern portion of the Atlantic Ocean and
 in the Pacific Ocean, i.e. on the true southern whale,
 and also upon the B. japonica living in the northern portion
 of the Pacific Ocean, and whose habitat is separated by
 a wide warm sea zone from the habitat of the former whale.
 Since the first alternative will doubtlessly be rejected
 by zoologists familiar with the special-distinction of the
 whales, there remains nothing but the second alternative:
 that C. ovalis lives not merely on Balaena australis, as
 it was assumed, but also upon B. japonica, and possibly
 on other Pacific rightwhales, if such rightwhales do exist
 (for example on B. antipodarum Gray).

"Cyamus Rhytinae" I.F. Brandt.

Size: $\frac{1}{2}$ inch long (Steller).

Habitat: upon the now extinct Steller's sea cow
 (Rhytina borealis), in the crevices of its skin, particularly
 on the flippers, tits, near anus, and the genitalia (Steller).

Quotations:

(1751). Steller: "Novi Commentarii Petropolitani", Vol. II, pages 298, 324, and 330.

(1753). Steller: "Ausführliche Beschreibung von sonderbaren Meerthieren", page 54, 97, and 106.

(1849). J.F. Brandt: "Symbolae Sirenologicae, quibus praecipue Rhytina historia naturalis illustratur" I, page 153 (Mémoires de l'academie de St. Pétersbourg", VI, série sc. natur. vol. V) (Cyamus s. Sirenocyamus Rhytinae).

What Steller informs us concerning this animal, which is now extinct together with its host, is approximately the following: "This sea cow is bothered by a particular insect, a kind of louse, which usually occurs in great quantities on the wrinkled fore-members, tits, genitalia, near the anus, and in the crevices of the skin. In places where these insects gnaw through both layers of the skin, there originate warts of leaking liquid. These insects attract sea-gulls, which therefore are seen landing upon the backs of sea-cows and removing these tidbits with their beaks. These insects are usually half an inch long, segmented, six-legged, white or yellowish, translucent. Their head is elongated and pointed, larger than a millet grain. On their foreheads are two short segmented (geniculatae), $\frac{1}{2}$ line long antennae, and instead of the lower jaw, they have two thin, two-segmented, very pointed at the end and spiky (clavata) small arms, just as in the Squillae (Caprellae ?). The remainder of the body is formed of 6 rings, one for

each of the leg pairs. These body segments are vaulted at the back and $1/3$ line (!) long. However the thoracic segment (i.e. second body segment) is twice as wide, while the other segments grow narrower towards the tail. From the sides of the "thoracic segment", which is shaped as a half-lens ("dimidium lentem refert [★]"), protrudes a couple of thick two-sectioned scissors, every one of them ending in a claw (aculeus), with the help of which they attach themselves very tightly to the epidermis of a sea cow. The other appendages are slimmer and gradually decrease in length, but they all end in a claw. The two last appendages are very short and emerge from the round tail segment (seventh body segment ?) and direct the movement of the animal in motion.

It is rather a picture of a cyamid, that comes in our mental image, when we read carefully this description, but some features wipe out the outline of this image. The fact that the first pair of legs (brachiola) is described as a two-sectioned, and the second pair of legs (chelae) is likewise described as two-sectioned, may perhaps be explained as a more or less innocent mistake on the part of the describing scientist. But was it really only $1/3$ of a line in width ^{★★} (the second body segment was $2/3$ ""'), then the body shape becomes extremely slim,

★) Misunderstood in the German translation.

★★) Of course one cannot interpret "wide" as "long"; since then the total length will only be 2 lines instead of 6.

not as in C. gracilis, with which Brandt, senior, compares it, but like in a caprellin. Perhaps, it was a caprellin? But the short antennae ($\frac{1}{2}$ '''), just as the fact that the caprellae ("Squillae") appear to be familiar animals to the describing scientist, do not indicate towards that this might have been a caprellin. Or, perhaps, there could have been a complete confusion in the measurement information? Then how should we understand Steller when he calls them six-legged? This is most probably because of the three pairs of rear legs (the front legs are mentioned by him as "small arms", instead of the first pair, and as "scissors" instead of the second pair of legs). Steller furthermore indicates, that there were just as many pairs of legs, as body segments, in other words: six pairs. Since he does not mention with one word whether these pairs were of different size than the other pairs, there could be a certain possibility, that the legs were not missing at all on the gill-carrying segments (if the gills perhaps were not easily observable from above, and therefore escaped his observation). Thus, it was not a true Cyamus, but rather a Leptomera-(Proto)-like body, or at least a transitional form between the cyamids and the caprellae, that one thinks about, as stated by J.F. Brandt long ago, who hypothetically referred this species to its own genus, - Sirenocyamus, in respect to which one has still to study, whether also other species of this genus still are living as parasites upon other still living sea cows: the dygong and the manatee.

If one cannot throw any light upon this description by Steller, which was respectable in its time, but still insufficient, then there will always remain divided opinion about the correct understanding of this cyamid, which was extinct together with its host animal. Recently, however, this understanding was directed into an unexpected direction by Dr. Alex Brandt's discovery. In 1871, he found in St. Petersburg-Museum's storerooms an alleged piece of skin of a Steller's sea cow proper. How this item came to the Museum is completely unknown. At least, it could not come from Steller himself. Upon this piece of skin a great number of specimens of cyamus of both sexes were attached, which Mr. Brandt, because of the accordance, which he finds between this piece of skin and the description of the skin of Rhytina by Steller, believes to be the true Cyamus Rhytinae J.F. Brandt, and for which he therefore published the description and a drawing. Here we are confronted with a peculiar fact, namely that the alleged C. Rhytinae shows so much resemblance to C. ovalis, which is one of the most typical and easiest recognizeable whale-louse species, that even to Dr. A. Brandt himself it became doubtful, whether this was anything but a sub-species of the other. As far as I were in position to judge in this matter, according to what was informed hereabout by Mr. B., I can only see, that Mr. Brandt's diagnosis is unable to keep it apart from C. ovalis, or in other words, the alleged louse of the Steller's sea cow, C. Rhytinae A. Brandt, does not differ as a species from C. ovalis from the southern whale and the North Pacific rightwhale^{x)}. This is certainly not what should have been expected, neither from the descriptions of Steller,

nor from what is otherwise known from the distribution of Cyamus-species etc., and because of this discord between what might have been reasonably expected, and what was probably found,

*) When this has already been written, Dr. Brandt had the kindness of sending me several specimens (2 males, 1 female, and several juveniles) of cyamids attached to the alleged Rhytina-skin. Thus I have been able to place them side by side with specimens of C. ovalis of equal size. I do not even find enough difference between them to discern them as varieties. The cleft in the front margin of the second body segment is seen as distinctly in one of the three available specimens of "C. Rhytinae", as in specimens of same size of C. ovalis, and the fact that it is not as distinct in the other two specimens may be caused by their shrivelling. The "brown rails" on the gills are probably a result of the shrivelling too. Scars during life could perhaps have given cause to this peculiarity. I find such a considerable difference in the width of the hand of the first pair of legs in the same individual of "C. Rhytinae" (see fig. 4 ¹¹ pl ♂), that it is impossible to use this feature as distinction between them. In C. ovalis the first tooth on the hand of the second pair of legs is generally slightly longer and slightly more pointed than the second tooth. However, if several hands of "C. Rhytinae" are compared, then one will find, even in

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there is reason to be sceptical in respect to the latter and to want to subject it to further test, to find out whether this piece of skin simply might be, from a baleen whale, and in particular from a Balaena japonica and not from a Rhytina. A fact, which Dr. Brandt states himself at the end of his paper, points in the direction. In the storerooms of St. Petersburg Museum Mr. B. found some small skin samples (collected by the late Wosnessensky) of a "Balaena mysticetus" (japonica?) caught at Kamchatka. These skin samples, which "have considerable resemblance" with an older skin-piece probably originating

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the same individual greater or smaller differences in the length of the teeth (see fig. 4x, ♂ p²); and in the studied female the second tooth is the longest one (see fig. 4 , p² ♀).

from a Steller's sea cow, namely with the latter's gnarled sections, and, as Dr. Brandt reminds us, about the words of Steller: "ejusmodi cuticula in nulla prorsus re mutata Balaenam ambit, licet ejusmodi nulla apud auctores fiat mentio" - are densely covered with cyamids, which "except for their greater size could be hardly distinguished from the alleged lice of the Steller's sea cow" ^{*)}.

As far as I can judge, there is a very great resemblance in the appearance and structure between the skin portions drawn by Dr. Brandt, which were assumed to come from a Rhytina, and between a number of skin portions in my possession, populated and gnawed by cyamids, which came from rightwhales of the North Pacific, and from other whale animals. Therefore, it appears to me to be the most reasonable solution of all the difficulties, to assume that it merely was a piece of a true whale skin, which Mr. Brandt found lying without further information at the St. Petersburg Museum. However, I turned to our erudite cetologist professor Reinhardt, in order to hear his opinion on this problem, which I was not knowledgeable enough to judge. He had the kindness to inform me, that "my suspicion, that the piece of skin we found might belong to a whale (and most probably to a Balaena), appears to him to be well-founded and is not contradicted by any particular in Dr. Brandt's

*) Mr. Brandt was also kind enough to send me a few specimens of these cyamids. He sent me two females, not fully adult, but in no respect from equally large females of C. ovalis. The teeth on the hand of the second pair of legs are exactly of the same size as in the preceding ones (see fig. 4xxx p²)

(description". He also adds, that he "cannot see anything against assuming that the found portion of skin comes from the head of a rightwhale", from where it has to come, since it has individual hairs, if it came from a true whale-animal at all. /p.4

Thus we did not come closer to the parasites of the Steller's sea cow in 1872, than we were in 1849.

8. Cyamus nodosus Ltk.

(Plate IV, fig. 8)

Distinguitur dorso nodoso (annulis corporis 3tio - 7mo sulcis longitudinalibus in partes 2-4 gibbosas divisis); branchiis sat brevibus; appendicibus branchialibus brevissimis, simplicibus, conicis; manibusque primi paris edentulis, secundi paris bidentatis.

Size: the male is 8 millimeters long and 3 millimeters wide; the female is 7 millimeters long and 4 millimeters wide.

Habitat: on the narwhal (Monodon) particularly on the skin around the tusk, but also on other parts of its body.

Synonym:

(1789). "Zoologia Danica" Vol. III, page 69, plate CXIX, fig. 13 - 17 (Oniscus ceti with exception of the quotations).

Description of the male: the body shape is rather narrow, but not flat, the individual segments are thick and more or less humpbacked. The first body segment

is completely fused with the head, and the second segment has nothing noteworthy to offer; the third and the fourth segments (which are hardly noticeably weaker than the subsequent ones^{*)}) are divided by longitudinal furrows into four, the fifth and the sixth segments - into three, and the seventh - indistinctly into two humps. The rear lateral corner of each segment (on the third and the fourth, and also on the front one) runs into a more or less distinct, round, or pointed nodule. The other antennae have approximately the length of the head, and a rather powerful built. The hand of the first pair of legs is without a "tooth"; the second one, however, has two "teeth". The gills are short ($2\frac{1}{2}$ millimeters) and plump; the first pair reaches to the eyes. The gill-appendices are conical and simple; they actually have a character of a spine protruding to a side, and only the comparison with other species indicates that they correspond to the so-called "gill-appendices". Spines on the ventral side of the rear body segment are absent, or at the most merely traceable as two blunt nodules on each of the last segments. In younger specimens the longitudinal furrows of the body segments disappear and the back is completely smooth. Naturally the gills here are still shorter and the body shape still slimmer. A young

*) In shrivelled specimens, just as in other Cyamus-species the weaker development of these two segments appears more distinctly.

male of a length of 4 millimeters is only one millimeter wide and has gills $\frac{1}{2}$ millimeter long.

The female is relatively broader and its third and fourth body segments are somewhat larger than in the male, which it otherwise resembles completely. A small pointed nodule, which as a rule may be seen at the base of each egg-plate, between the latter and the gill-stalk, it corresponds undoubtedly to the male's "gill-appendix". In young females (5 millimeters) with only semi-developed egg-plates, it is completely absent.

/p.275

According to our present experience C. nodosus must occur in considerable numbers on the narwhal. With respect to the occurrence of this species together with C. monodontis, we refer to what is said about this species above. I have only to add here, that since its name C. Belugae, under which it is known here in the country, and under which I know it has been forwarded to other collections, this gives, or might give an impression that it should live on the "White Fish" (*Delphinapterus beluga*), however, as far as I know this is unfounded. Since, however, the narwhal and the Beluga are very closely related animals ^{*)} (much closer relatives than one perhaps often assumes), I do not dare to maintain, that as it evidently lives on the narwhal, it cannot also live on the Beluga. In meantime, I have often asked

*) See, for example, survey table of Flowers of the whale genera in "Trans. Zool. Soc." VI (1869), page 115, where the Beluga and the Monodon form one of the 5 sub-families (Beluginae) of the toothed whales.

often asked people, who through prolonged sojourn on Greenland were familiar with the nature of that country, whether they ever had seen "lice" on the true "White Fish" (Beluga), - an animal of which 500 specimens are caught annually, but I have always received a negative answer, while on the other hand, they were very familiar with the parasites of the narwhal. But at the same time, I was informed (an information which already may be found in Fabricius "Fauna Gronlandica", page 30 and 50), and which I believe may completely disperse the misunderstanding, that I believe had taken place here, namely that these two whale-species are often confused in Greenland, as the Greenlandic language has a common name ("Kelelluak") for them both; since this name by Danish colonists is translated as "White Fish" the Greenlandic name of the Beluga ("Kelelluak kernektok") by "white White Fish" and the name of the narwhal, as "black White Fish" (Kelelluak kakortok). Specimens of the narwhal's whale-lice could therefore very well be sent as taken from the "White Fish" ("Kelelluak"), but originally it would have been meant "the black White Fish", i.e. the narwhal. ^{xx)}

xx) Dr. Brandt ("Bericht", page 699) states that the St. Petersburg Museum had once received specimens of C. nodosus from the late State-councillor Eschricht, as "Cyamus delphini globicipitis from the Faeroes", and from here he concludes, that C. nodosus also occurs on the pilot whale. This, I permit myself to doubt most definitely. If there was a jar in the Eschricht's museum with a portion of whale skin with the above-stated or a similar text, then I bear no doubt, that this must be owing to a

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I cannot leave unmentioned, that in the Physiological Museum (the Eschricht Museum) are also kept some young specimens of a whale-louse form, that are supposed to be taken "in Delphino sp.", unfortunately, without any further information. Their length is maximum $4 - 4\frac{1}{2}$ millimeters. They belong evidently to the other sub-section of the Cyamus - genus, to which belong C. nodosus, gracilis, /p.48 and globicipitis, and since both sexes have two teeth on the hand of the second pair of legs, they should rather be compared with the C. nodosus. They also agree with this species by the relatively short gills and the single, cone, or spine-formed gill-appendices in both sexes, just as in the absence of nodules or spines on the ventral side of the body segments in general. If it is, however, compared with specimens of C. nodosus of same size, then the form taken from the "dolphins" is not so narrow, has longer antennae, the gill-carrying segments are relatively weaker, the gills are much longer and thinner, and generally have the appearance of being considerably closer to their final development stage; thus the gill-appendices are still not present in some specimens of the narwhal-louse of this size. The discussed dolphin-lice

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memory-error or to a text confusion, caused by the fact, that E. had received portions of the pilot whale skin from the Faeroes, and of a narwhal skin from Greenland with cyamids. The portion in question is beyond doubt from a narwhal and from Greenland, with the fauna of which country's E. stood in very active connection during a period of many years.

of this size. The discussed dolphin-lice thus must belong to their own species, which is still unknown in its fully developed form (a female of 4 millimeters length has still only semi-developed egg-plates), but about which one may say, that it hardly becomes as large as C. nodosus, which is, however, one of the smaller species of the genus. Since it still cannot be characterized in a satisfactory manner, and it is still unknown, upon which dolphin-species it was found, I am unwilling to give it any special name, but will merely point out the presence of such a form for the sake of the future scientists and the science. The probability that the "dolphin" from which it was taken, should exactly be the beluga, is hardly great. Neither can it be identified as C. Delphini Guérin. (Concerning observations of Bennett on the whale-lice on the "dolphins" is discussed above on page 242).

9. Cyamus globicipitis Ltk.

(Plate IV, fig. 9)

Distinguitur forma sat. gracili; annulo corporis secundo maximo; manibus pedum secundi paris dente unico, ungui approximato; antennis superioribus validis, latis; branchiis brevibus; cornubus anterioribus appendicum branchialium in maribus elongatis branchiiformibus, in faeminis vero deficientibus; spinis ventralibus valde conspicuis.

Size: the male is 9 millimeters long, 4 millimeters wide; the female is $6\frac{1}{2}$ millimeters long, and $2\frac{1}{2}$ millimeters wide.

(Habitus: upon the pilot whale (Globicephalus melas), on the body and near the teeth.

Synonyms: Steenstrup: "Temporary remarks on the occurrence of an Otion and a Cyamus on the Faeroe pilot whale (Delphinus globiceps Auct.) (Scientific Report on the Naturalist Association" for 1843, page 95). (Cyamus sp.n.?)

Description of a male: The shape is rather narrow and elongated; the second body segment is very large and has appearance of being cut into the front in order to receive the head, with which the first body segment is so completely fused, that it cannot be recognized as an independent segment. The third and the fourth segments are slightly smaller than the other ones. The upper antennae are relatively large (approximately 3 millimeters), twice as long as the head, but particularly very wide at the base of the almost club-like swelling of the two interior joints; the lower antennae are very small, non-sectionized. The first pair of legs is slender, compressed, the hand has no tooth; the second pair of legs has only one tooth (all the other known Cyamus-species, with exception of C. gracilis, have two), which sit close to the claw; its hip has a pointed nodule, which turns straight upwards and may be seen on each side of the head. The hip of the three pairs of rear-legs runs also forward into a distinct point or a small spine. The gills are short; the first pair reaches only to the head, but almost equally large are completely gill-like four gill-appendices hidden under the venter. These gill-appendices correspond to the front (interior) horn of the so-called gill-appendix /p.27

of the other Cyamus-species ^{*)}. Directly behind each of these gill-appendices is a horizontal spine corresponding to the rear (exterior) branch or horn of the ordinary gill-appendices. Under each of the three last body segments, we find two strong spines, which are somewhat turned forwards.

In juveniles the gill-appendices disappear, the gills proper - become shorter, etc.

The female differs from the male (besides in its size) in the lack of the gill-appendices proper (which here are converted into egg-plates), but the spines representing the rear horns of the latter are present. They also differ from the males by the absence of spines on the ventral side of the fifth segment, and finally, by the gill-bearing body segments being completely similar to the subsequent segments. In respect to the size and form of the gills of the first and second pair of legs, I see no difference between animals of the two sexes.

Cyamus globicipitis has been sent several times from the Faeroe Islands by District Administrator Müller, who took them off of a pilot whale. We have no recent experience in whether it is exclusively, or only preferably found on sick or wounded and famished individuals, as tentatively suggested by professor Steenstrup in his above-quoted small report. But this assumption seems to be reasonable enough, since this species was sent us only a few times. From facts reported in the above publication, we see that these parasites are found on the body and in the wrinkles around the teeth. Dr. Brandt

*) It may also be possible (though probably less correct) to describe the male pilot-whale louse as being equipped with double gills and single (spino-forming) gill appendices.

Dr. Brandt has expressed the assumption, that C. Delphini Guér. is closely related with, or perhaps even is an identical species as, the D. globicipitis m. Naturally this is not impossible, but it would, however, be very incorrect to reconstitute the Guérin name for the pilot-whale louse; as long as it is not proved with greater certainty, that it occurs in other pilot whale species, or that our Scandinavian pilot whale can extend its migrations to the West Indies. It must, however, be remembered, that whale-lice were observed in southern species of pilot-whales /p.50 (Gl. macrorhynchus), and according to what we now know about the distribution conditions of the cyamids, it will not surprise us, if this parasite would be the same species as C. globicipitis.

10. Cyamus gracilis R.d.V.

(Plate IV, fig. 10).

Distinguitur forma gracili; annulis corporis posteriobus lateraliter dentatis; manibus pedum primi et secundi paris in maribus adultis dente singulo, in faeminis plane edentulis; branchiis mediocribus, simplicibus; appendicibus branchialibus in maribus adultis duplicibus, minutis, in faeminis deficientibus; spinis abdominalibus nullis.

Size: The male is 10 millimeters long, $3\frac{1}{2}$ millimeters wide; the female is 8 millimeters long and 3 millimeters wide.

Colour: "clear yellow" (Rouss. de Vauz.).

Habitat: on the southern whale (*Balaena australis*), on the nodules of the head, together with *C. ovalis* (R. de V.), and on *B. japonica*?

Synonyms and Quotations:

(1834). Roussell de Vauzème l.c. page 229, plate 8, fig. 24 - 25 (♂) (*C. gracilis*).

(1840). Milne-Edwards, "Hist. natur. d. Crust.", volume III, page 113 (*C. gracilis*).

(1862). Spence Bate: "Catalogue" etc. page 366, plate 58, fig. 1 (according to the specimens from Cape in the Paris Museum) (*C. gracilis*).

(1866). Spence Bate & Westwood: "British sessile-eyed Crustacea", Vol. II, plate 94, fig. 1 (Copied from R. de V.) and fig. 2 (copied from "Cat. Amphip. Crust." l.c.? ^{*)} (*C. gracilis*).

Description of a male. The shape is elongated, narrow, almost equally wide everywhere. The head is elongated. The upper antennae are slender and approximately are of same length as the head. The second body segment is swollen and larger (longer) than the other ones.

*) The third figure represents a young (non-adult) whale-louse from the British seas, which White identified as *C. gracilis*; it is this, as far as I can see undeterminable form, which gave the reason for the inclusion of "*C. gracilis*" in the British fauna.

but has no incision in the front. The third and the fourth body segments are noticeably, but not much ^{*)} weaker than the subsequent body segments; on either lateral margin of the latter, we see two nodules, which take the gill between them. On the fifth and the sixth segment there were three such small nodules or points. On the seventh segment they were less distinct again. The hand of the first pair of legs has a distinct "tooth" in the fully adult male, and the hand of the second pair has a "tooth", or a forwards turned pointed nodule at the base of the claw. The gills are simple, cylindrical, approximately 4 millimeters long; if extended, they would reach along the head. The gill-appendices are double (bicornate or crescent-shaped), /p.279/ but small. The spines under the venter are completely lacking.

Already in males of approximately 8 millimeters in length (which one might easily had confused with ^{**) fully developed ones} the "tooth" on the hand of the

*) In shrivelled specimens these two segments contract usually more than the other segments. The figure of the male, plate IV is taken from a shrivelled specimen, as fully adult specimens in alcohol were not available, thus the specimen was not true to nature in this respect. However, in my description, I was guided by somewhat younger specimens, which were kept in alcohol.

**) I have studied many males of C. gracilis, both from the Cape, and from the northern portion of the Pacific Ocean, without encountering specimens with well-developed gill-appendices or traces of the tooth on the hand of the second pair of legs, and I did not know how to bring them in agreement with the drawings of Roussell (who represented the gill-appendices as small, but still distinct and indicated the presence of one, or rather /continued on the next page/

second pair of legs has disappeared, the gill-appendices are indistinct, and difference from females is generally smaller.

The females are much smaller, the body segments are generally more uniform, in particular - the gill-carrying segments do not differ from the others. The gills are also somewhat shorter, and the hands of both the first

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of two "teeth" on the hand of the second pair of legs), as I considered my specimens as fully adult. Only after having received a considerable number of dried specimens from Dr. Packard, the majority of which actually did fully agree with my previous observations, there still were some larger specimens, which had distinct gill-appendices and a very distinct tooth at the above-mentioned point, I became aware, that previously I was studying nothing but specimens, which had not yet reached the climax of their development. Such not fully developed specimens were available to Dr. Brandt and were the cause of his doubt concerning the accuracy of the drawings of Roussell de Vauzème, who in his turn does not illustrate properly the shape of the hand, neither in the young, nor in the old specimens.

and of the second pair of legs are completely without teeth or nodules. I find no trace of the gill-appendices. Already at a length of 6 millimeters the two sexes are identical to such a degree, than when the egg-plates or the copulation organs were underdeveloped, I was unable to decide, whether I was observing a male, or a female.

The available specimens, whose home is more or less known to me, are either "from the waters around Kamchatka", or "from near Patagonia". The occurrence of the species is thus quite the same as in C. ovalis, and I can therefore refer to what it stated above (page 270) in order to give my reasons to believe, that both of these species occur both on Balaena australis and on B. japonica (?).

11. Platycyamus Thompsoni (Gosse).

(Plate IV, fig. 11).

Distinguitur corpore valde depresso, fere laminari; annulo primo corporis a capite bene sejuncto; pedibus primi paris secundi paris fere fere aequantibus hisceque antepositis; branchiis brevissimis conicis; appendicibus in maribus minutis, spiniformibus.

Size: The male is 6 millimeters long, the female - 8 millimeters.

Habitus: on the bottlenose whale, both on the common (Faeroe) bottlenose whale (Hyperodon rostratus) and on the broad-foreheaded bottlenose whale (Hyperodon latifrons Gr.).

Synonyms and Quotations:

(1855). Gosse: "Mar.Zool. I, page 131
(Cyamus Thompsoni) (quoted according to Spence Bate).

(1855). Gosse: "Notes on some new or little
known marine animals", fasc. II. ("Annals and Magazine
of natural history", XVI (1855), page 30 - 31, plate III,
fig. 11) . (Cyamus Thompsoni)^{*)}

(1857). White: "A popular history of Bri-
tish Crustacea", page 219 (Cyamus Thompsoni; but mentioned
with incorrect information of being found on a "dolphin").

(1857). Spence Bate: "A synopsis of the
British Edriophthalmous Crustacea part I. Amphipoda"
(Annals and Magaz. of natur. hist. 2nd series, volume
XIX, page 152) (Cyamus gracilis Gosse); later (ibid. XX,
page 525) corrected to C. Thompsoni Gosse).

(1862). Spence Bate: "Catal. of Amphipoda
in the British Museum" page 368, plate 58, fig. 5. (Copy
of Gosse's figures) (C. Thompsoni).

(1866). Spence and Westwood: "A history of
British sessile-eyed Crustacea", II, page 96^{**))}

*) "Body about 1/6 of an inch in length. Five pairs
of feet equally developed; all 5-jointed; all with the
penultimate joint large and ovate. Third and fourth seg-
ments each furnished with a single small oval appendage."

**) "Head triangular; antennae very short; two middle

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(with wood cut according to Gosse's original specimen in the "British Museum", which was taken by William Thompson from a "Hyperoodon bidens")

(The synonym "C. Delphinii Guér," is eliminated).

This species takes a very isolated position among the known species of the whale louse. The extreme flatness of the body and of the appendages, and the almost paper-like thinness gives this species a fully original appearance or habitus. Furthermore, the head is very distinctly separated from the first body segment, and the first pair of legs is attached not below, but in front of the second one, and the second pair of legs is not much smaller than the first one. Finally, we have the different nature of the non-segmented mandibles (Plate IV, fig. 11 pm). Gosse had already pointed out, that the set-up marks of distinction for the Cyamus-genus should be altered, if this species should be included therein. It is probably well-grounded or rather is unavoidably necessary to set-up this type as separate genus (see page 250). As the females here, - contrary to what takes place in the true Cyami - seem to attain a considerably greater size than the males, I will start with the description of the female.

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segments of body narrower than the preceding and following. First and second pairs of legs are equal in size, and not longer than the posterior pairs. Third and fourth segments with a single very short oval branches on each side."

Description of the female. It attains a length of 8 millimeters and a width of slightly over 3 millimeters. The outline of the body is a rather small oval. Its flatness and almost paper-like nature are discussed above. The body segments are distinctly separated until approximately the median line, just as in other whale lice, except for the two gill-carrying segments (the third and the fourth), which are fused together to a larger part of their width; a small round groove on each side of the median line indicates, however the ordinary (and original ?) division. /p. 281/

The first body segment is separated from the head by an oblique furrow on each side. The rear margin of the second segment has a protruding point on each side, approximately halfway between the attachment point of the leg and the connection of the body segment. The third segment has a round nodule in its rearmost lateral corner, and the fourth one has a similar nodule near its frontmost lateral corner. The upper antennae are short and rather wide, approximately as long as the head itself. The first pair of legs is almost just as developed as the second one, and the latter it is flattened and appears to be. The hand forms a flat sharp "tooth", on the side turning against the claw. The first pair of legs consists, as usual, of four well-developed segments, besides the claw, the second pair - of only three, of which the frontwards hip-joint forms a large double flap, or a two-flapped nodule. The hand has two powerful "teeth". The three pairs of rear legs are just as heavily flattened and consist of four distinct joints. Each hip joint has from the rear (just as in the two first

pairs of legs) a small cleft, but furthermore they have in the front and below (at their front margin) two small spines; the third-last (middle) joint has also a small spine underneath, but at the interior rear corner, and the second-last one has a slight trace of a tooth or nodule at its rear margin. The gills are short, conical, approximately 2 millimeters long; the rear pair attains at the most to the front margin of the third body segment. At the base of each of the rear egg-plates is a small nodule, and hidden ^{*)} under these plates is a small cylindric or cone-shaped gill-appendix, located within and in front of each of the attachment points of the true gills. Upon each of the three last body segments, we find at their front margin, two distinct spines located underneath, and on the last one another two small ones behind the others.

The males seem always to be smaller than the females. In an earlier series of specimens, which the district-administrator Müller has collected from the common bottlenose whale, none of the males are longer than 4 millimeters (2 millimeters in width), while the females were twice as large (8 millimeters in length). In a later shipment the misproportion is smaller, as the females are not longer than 7, and the males are up to

*) Therefore no consideration is taken to them in the "survey" ("Synopsis"), page 250, which perhaps should have been the case.

6 millimeters in length ($2\frac{1}{2}$ millimeters wide), and approximately the same size have the three males, that were taken of a wide-and white-foreheaded bottle nose whale (Hyperoodon latifrons), beached in Skaale fiord, June 29th, 1861.

I was unable to discern these three males from the males of the whale-louse occurring on the common bottlenose. Corresponding females were not sent to me at the same occasion. The male's gill-carrying segments are smaller than the other body segments (both shorter and narrower) and are not fused, and the gills are relatively somewhat smaller. On the usual place of the gill-appendices, we find here a small, laterally directed, pointed nodule or conical spine, on each side of the third and fourth body segment, at the base of the gills. Otherwise, I see no difference between the male and the female, except the sex or copulation organs proper.

Since the Cyamus Thompsoni of Gosse is explicitly stated to be taken from a "Hyperoodon bidens", and /p.54/ since the description and the drawing agree on basic points with the available bottlenose-whale lice, it must be properly classified as belonging to species set-up by English faunists. It appears from these descriptions, however, that merely one specimen was available to these authors. This specimen is kept at "British Museum". Both the drawings of Gosse and of Spence Bates made out from this specimen. This specimen, however, contrary to what Spence Bate and his associates believed, was not in an "immature state". This specimen is a male, $1/5 - 1/6$ ", thus of a size, at which this sex has its final, fully developed appearance. The assumption, that this Cyamus Delphini Guérin could be the developed form of this assumed Cyamus - juvenile, thus

is without any basis. The Guérin species (see above on page 277) is a true Cyamus, and not a Platycyamus.

According to the above-stated information, it should be assumed that Platycyamus Thompsoni inhabits not only the common bottlenose whale, but also the much less common and much less known broad-foreheaded bottlenose whale (Hyperoodon latifrons). I regret, that I have not been able to confirm this interesting fact further through a study of the still unknown female of the whale-louse of the Hyperoodon latifrons.

Postscript. Just as the final portion of this article was about to go to the presses, I received the February-copy of "The Annals and Magazine of natural history" for 1873, in which we find a reprint - according to the November-copy of "Proc. Calif. Acad. Sci." for 1872, - of short descriptions by W.H. Dall, "U.S. Coast Survey", of the three whale-louse species from whales caught at the North-American West Coast. These species are going to be shown in the announced work of Captain Scammon on the whale animals of the North Pacific Ocean. One of these is called C. mysticeti and lives upon the northern "Bowheads", which are considered to be the true Balaena mysticetus, in the area adjoining the Strait of Bering^{*)}. To the author only 2 females were available /p. 283

*) Because of Mr. Dall's indication to look up the reports of Capt. Scammon on whale animals at the North American West Coast, published by Prof. Cope

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of this species, as far as I can judge from the description, this seems to be the true C. mysticeti, that he studied. The second C. Scammoni, which lives on the "Californian grey whale" (Rhachianectes glaucus Cope) - a right whale with short baleens and separated neck discs, - is doubtlessly a new species, which one probably will have to place

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(Proceedings of the Academy of Natur. Sc. of Philadelphia, 1869), I find (page 34), however, under "Bowhead Whale, Balaena mysticetus Linn. the remark, "all Bowheads found on this cruising ground (i.e. near the Strait of Bering, south and north of the same) are quite free from parasitic crustaceans, as well as barnacles." Furthermore there is stated (page 50): "The Humpback (Megaptera ver-sabilis) as well as all the other whales except the Bowhead or Arctic Whale are infested with parasitic crustaceans, which collect about the head, particularly near the spoutholes, and if there are any scars and sores on the animal's body, this vermin is sure to find them." Then it is mentioned, that upon an unusually skinny humpback whale many spots with these parasites were detected, and that several of these spots were 3-4 feet in diameter. The poor condition of the whale was ascribed to the exceptional quantity of these "troublesome creatures" on them. On page 60, these "crab lice" are also mentioned in connection with the sperm whale. In the stressed words on page 50 it seems to have been stated, that the true humpback whales also have

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between C. ovalis and C. Kessleri. Certain points in the description are not clear to me, for example, that each gill "at its base is divided into two cylindrical spiral-rolled threads" (here, as we see below, it is not thought about the gill-appendices). Both sexes of this species are known. The third species, C. suffusus, which lives on the humpback whale (Megaptera versabilis C.) is on the other hand, only known as male. According to the description it is very close to my C. pacificus and will probably coincide with it. In such case I do not understand, why the third segment of the rear legs is said to be "keeled above", or the such feature as "no ventral lines on the posterior segments" is stated. If one puts "spines" instead of "lines", then it makes sense, but then the spines on the ventral side of the two last body segments must be forgotten, or are insignificant in the specimens available to Mr. Dall, these specimens being doubtlessly somewhat larger than in mine. Neither does his description agree with the characteristic "body elongate" that the width is stated to be one half of the length. There

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whale lice; but we have no experience in this direction, and Dall does not describe any humpback whale louse.

In connection with what had been mentioned on page 262 concerning the colour of the Krepokak-louse, I must add, that I have later found notes of pastor Jørgensen, according to which "of many living specimens some were quite brown, while others completely white."

stated to be one half of the length. There could actually be almost as good reason of thinking of C. boopis. The announced further information on these Pacific whale-louse species, would therefore be of considerable interest in several respects, and would supplement in a very desirable way the collected contribution in this small work to the knowledge of these parasites.

Explanation to the Plates.

As the names of the species are written on copper plates, and as furthermore they give information which of the figures represent males and which - females or parts of them, a detailed explanation is probably unnecessary.

Although the used letters in most cases are self-explanatory, I will, nevertheless, not omit to point out that:

- 1
a - means the upper antennae,
- 2
a - the lower (smaller) antennae,
- 1
p - first
- 2) pair of legs or the hand of the same,
- p - second
- mp or pm : mandibles (Plate I, fig. 2 mp and
 Plate IV, fig. 11 pm);
- *)
- x - gill-appendices; ov - egg-plates

*) TR: This letter is not clear on the photostat-copy submitted for translation.

sp - spines at the base of the gill-appendices (Plate II, fig. 3 ♂¹ *; t - nodule in the rear lateral corner of the gill-carrying body segment; Dr. Brandt considered it to be a part of the gill-appendix);

⁶
p - the sixth pair of legs (Plate II, fig. 3 ♀ ** shows also the nodules on the under-side of the sixth body segment).

Plate I, fig. 2 ♂¹ a : first antenna of an individual other than the one shown below, in order to demonstrate the variation in form.

Plate II, fig. 4^{*}, 4^{**}, and 4^{***}; parts of the whale louse (C. ovalis), which Dr. Alex. Brandt took for C. Rhytinae; fig. 4^{****} shows those collected by Wosnessensky.

Plate IV, fig. 10 ♂² p of a younger (but male) individual than on the main figure (10 ♂).

The gills are everywhere filled with points in order to stress their deviating nature; the same is done in the case of the gill-like gill-appendices in the male C. globicipitis (Plate IV, fig. 9 ♂).

The fractions under main figures indicate how many times they are enlarged; the natural size of details represented in a different scale may easily be determined in that way.

It should also be noted, that the rear legs in all the represented specimens are not straightened, or pulled out in equally degree, this may give inaccurate

impression of the individual forms assuming that they are more short-legged, than in reality, when compared to other species together with which they are represented.
