THE LAND AND FRESH-WATER CRUSTACEA

OF THE

DISTRICT AROUND EDINBURGH.

PART II.—THE OSTRACODA AND COPEPODA.

BY

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[*Reprinted from the Proceedings of the Royal Physical Society, Edinburgh, 1892-93, vol. xii., July 12, 1893.*]

VI. *The Land and Fresh-Water Crustacea of the District around Edinburgh.* Part II.—*The Ostracoda and Copepoda.* By THOMAS SCOTT, Esq., F.L.S., Cor. Mem. Glas. Geol. Soc. and Nat. Hist. Soc. of Glasgow.

(Read 19th April 1893.)

In a previous communication I gave a short account of the land and fresh-water Amphipoda and Isopoda of the Edinburgh district; in this paper I propose to notice two of the groups of the Entomostraca, viz., the Ostracoda and Copepoda. I intended to have given an account of these groups during the previous session of the Royal Physical Society, but want of time compelled me, reluctantly, to delay doing so till a more convenient season. One of the chief difficulties in dealing with the larger or "higher" Crustacea is to find the specimens, but the chief difficulty with the micro-forms—

which, as a rule, are plentiful enough—is rather the determination of the species. To critically examine thousands of these minute organisms is a task requiring not only patience, but a considerable amount of time, because it is often absolutely necessary to dissect the specimens in order to determine, not only specific, but, also, generic differences. To simply crush the animal under a cover-glass, and take the risk of finding one or more of the appendages in a favourable position, is, to say the least of it, a clumsy and unsatisfactory method. No doubt, to dissect, for example, a Copepod, perhaps the thirtieth to the fiftieth of an inch in length, limb from limb, in consecutive order, so as to ascertain the exact relative position of each member, and thus be enabled to make a correct comparison of the one with the other, requires some practice and dexterity, yet only in this way can a reliable knowledge of the structure and relationship of the parts be acquired. But, though the difficulty of such a procedure be apparently great, it is quite surmountable—my son, Mr Andrew Scott, to whom I am much indebted for help of this kind in preparing material for the present paper, is often able to prepare a complete series of appendages from a single Copepod, viz., anterior and posterior antennæ, mandibles, maxillæ, anterior and posterior foot-jaws, and the five pairs of thoracic feet, and this has often permitted a satisfactory discrimination to be made, which would otherwise have been well-nigh impossible.

Next session I hope to be able to prepare an account of the Cladocera of the district, when I shall, probably, notice any species belonging to the other groups which may have previously escaped observation.

THE OSTRACODA.

I propose, in the first place, to deal with the Ostracoda of the area.

It will be understood that the district limits are the same as described in my previous paper, and in Mr Evans's memoir on the Mammalia in the *Proceedings of the Royal Physical Society*, published in 1892.

At a meeting of the Royal Physical Society, held on the 22nd of January 1890, I had the privilege of exhibiting a

small collection of Ostracoda, and of drawing attention to a few of the more interesting species that had been obtained within the Edinburgh district; the aim of the present communication is to put on record all the species—common as well as rare—that are known to occur within the prescribed area. But, before proceeding to give an enumeration of the species, it may be desirable to offer a few remarks upon the distribution of the Ostracoda.

Speaking generally, the Ostracoda are to be found almost everywhere where there are pools of water. Some of them are more commonly found in water of questionable purity, such as may be seen stagnant in ditches and marshy ground, and possessing an odour of a rather disagreeable kind; but, while that is the case, I do not remember having ever observed Ostracoda in water that was largely mixed with sewage,—the impurity of the water in which such species are found is usually the result of the decay of vegetable matter in the bottom or round the sides of the pool, or loch. It may be also stated, as a rule, that all the species are more or less confined to still water, as that of ponds, lochs, canals, etc., and are rarely obtained in running water. There are some curious and interesting problems, relating to the laws of distribution of species, presented by the Ostracoda—in one locality a single species may be found in the greatest abundance to the exclusion of almost every other form, while in another locality, where the conditions appear to be equally favourable, that species may be very scarce or entirely absent. To bring out this more clearly, I may relate my experience of a single species, viz., *Cypris incongruens*. In Garvel Park, Greenock, previous to the construction of the James Watt Dock, there were some pools of water, and during May 1880, the weather being dry and warm, one of these pools dried up. There had been a good deal of conferva in the pool, and this, when the water disappeared, formed a substance, almost like felt, covering the bottom. On removing some of this felt-like material, *Cypris incongruens* was observed in myriads, and, so far as I remember, was the only Ostracod present. During the autumn of 1888 I happened to be several times in the neighbourhood of

Portobello, and visited the brickfield at the west end of the town; in one or two of the pools in the disused part of the brickfield, the same species was in great abundance, to the exclusion of almost every other form. During September 1890, I made an examination of some shallow pools of water on May Island, when *Cypris incongruens* was observed to be moderately common, and this was the only fresh-water Ostracod I found on the island. I have now to notice a still more curious fact relating to the distribution of this species. In September 1887, my son, Mr Andrew Scott, who was, at that time, assistant chemist in the laboratory of the Baker Street Sugar Refinery, Greenock, belonging to Messrs Alexander Scott & Sons,—wrote me as follows:—"I was up at one of the tanks on the roof of the sugar-house, and observed that the bottom was quite yellow. On closer examination the yellow substance turned out to be Ostracoda—chiefly *Cypris incongruens;* there is also a *Candona*, I think" (this was *Candona candida*). "The tank was being cleaned out, so I took some of the mud, etc., for preservation. Now the curious thing is, how did the Ostracods get into the tank, seeing that any water that gathers is rain water, and the tank is cleaned out once a year?"

Being desirous for further information about this matter, I wrote to the manager of the sugar-house, Mr Alexander S. MacLean (whom I have the privilege of counting as one of my friends), drawing his attention to the subject, and asking if he knew of any means by which the Ostracods could have been introduced; and on 21st January 1888, he sent me the following interesting note:—"Now as to the Ostracods, the tanks referred to consist of a set of three, measuring 40 feet by 16 feet by 4 feet 6 inches deep, they are formed of cast-iron plates, and stand about 100 feet above the ground. One is covered with yellow pine boards, the other two are uncovered. They were wont to be supplied with water from Loch Thom, but the supply was shut off at the meter inlet four years ago when the tanks ceased to be used. Rain water collects in the two uncovered tanks, and that is the only water that has entered them since the Loch Thom water was shut off. I know, therefore, of no way by which these little animals could get in except by adhering to the claws of

birds. And that this is probably the true means, appears from the fact that, the char-house being idle, birds have all freedom to alight undisturbed in and about the tanks. I have frequently seen starlings, wagtails, and house-sparrows, and sometimes a robin redbreast, sitting on the sides of the tanks." Such is Mr MacLean's account of this interesting example of the apparently erratic distribution of these Ostracods.

In case it may be thought that the Ostracods were descended from those that may have been introduced before the supply of the Loch Thom water was shut off, I should, perhaps, add this further explanation. The only water that could get into the tanks, during the lengthened period they were not in use, was, as stated by my correspondent, supplied from the clouds, and, though that supply is sometimes considerable, it was seldom allowed to collect in any quantity. The uncovered tanks were separated from each other by a partition formed of iron plates; one of the tanks had an outlet pipe flush with the bottom, so that when necessary *all* the water from that tank could be run off; the second tank communicated with the first by a round hole through the iron partition, at about three or four inches from the bottom. In the one tank, therefore, all the water drained off as it fell, while, in the other, not more than a depth of three or four inches could collect, unless the hole in the iron partition was closed, which was rarely done. Being continually exposed to the sun and air, both tanks were consequently dry during a considerable part of the summer, unless the season were unusually wet. Mud, consisting of dust, blown by the wind, and of carbonaceous matter from the chimneys, collected in the bottoms of the tanks, but it was never allowed to accumulate, though the tanks were not in use; as a matter of fact, the tanks had been cleaned out, at least, twice since the time when the Loch Thom water was shut off, and before Ostracods were discovered. When the tanks were cleaned, the rust was carefully chipped or scraped off the cast-iron sides, which were then coated with tar, and the bottoms were swept with a brush; it is, therefore, hardly possible that the Ostracods observed could have been descendants from any that may have been introduced with the Loch Thom

water; and, moreover, I do not remember having ever obtained *Cypris incongruens* in Loch Thom.

It has, also, to be kept in mind that Ostracoda die very soon if exposed to the air, though they can survive a few days when enclosed in damp mud or vegetable matter. The eggs of Entomostraca possess much greater vitality than the adult animals, and may, after a considerable lapse of time, be revived, as has been demonstrated by Professor G. O. Sars, who has raised Entomostraca from dried Australian mud; but the case I have described is different, in that the tank was cleaned out with a brush, so that, practically, no mud was left to form a protection, for either adults or eggs, from the scorching rays of the summer's sun, yet nevertheless, here was a species of Ostracod in such immense numbers as to impart a yellow colour to the bottom of the tank.

Cypris incongruens, though thus abundant and occurring in such out-of-the-way places, is yet by no means so ubiquitous as such examples would seem to imply. It is no uncommon experience to seek for it in vain where all the conditions favourable to its existence appear to be present. But this Ostracod is not only seemingly capricious in its selection of a habitat, it is also capable of living under very varied conditions, both as regards the temperature and the purity of the water. Mr David Robertson, the veteran Scottish naturalist, obtained it, many years ago, in a mill cooling-pond at Paisley. "Where the water issued into the pond, the temperature was 90° Fahr., and the surface water 80° Fahr.; the Ostracods were found in the mud farthest from the heat." On the other hand, my son obtained the same species at Greenock, in a ditch where there was very little water, and what there was of it, covered with a coating of ice. It may also be found in brackish, as well as in clean, water, and in water so impure, from decomposing vegetable matter, as to be offensive both to sight and to smell.

It will not be understood, though I have thus tried to illustrate the vagrant distribution of a particular species, that such a distribution is exceptional, or confined to that species. It may be observed, more or less, in many other species belonging to the group. It is this kind of distribution that makes the study of these minute organisms

more interesting, because rare forms turn up in such unlikely and exceptional localities, that the expectation is kept always, more or less, active and on the alert.

The Ostracoda, which may thus form a suitable subject for a leisure-time study, are not only of interest to the naturalist, but are also of value from a merely utilitarian point of view, seeing that fish are not indifferent to them as an article of food; hence, it is the experience of the student that limited localities frequented by the trout and the stickleback are not, commonly, the best hunting-grounds for Ostracoda. Another point worth noticing is the dissimilarity of species between the east and the west sides of Scotland. Though a considerable amount of attention has been devoted to the Ostracoda for many years, the difference in this respect remains fairly constant. No doubt, the difference has varied during the course of these years,—species that appeared to be confined to one side have been discovered on the other; but, while there was this tendency to equalisation, the research which led to it also brought to light other forms, and these, being, for the present, at least, apparently confined to the east or the west sides, cause the difference still to remain. The species that are at present apparently confined to the east or the west of Scotland are few in number, and may be best shown in tabulated form, thus:

TABLE I.

Species found on the east side of Scotland, but not hitherto on the west side.	Species found on the west side of Scotland, but not hitherto on the east side.
Cypris pubera, O. F. Müller.	*Scottia browniana*[1] (T. R. Jones).
Erpetocypris violacea, Brady and Norman.	*Erpetocypris robertsoni*, Brady and Norman.
	Cypridopsis newtoni, Brady and Robertson.
	Cypridopsis variegata, Brady and Norman.
	Darwinula stevensoni,[1] Brady and Robertson.

[1] *Scottia browniana* has been obtained common in a post-Tertiary deposit at Elie in Fifeshire (*see* Proc. Roy. Phys. Soc. Edin., vol. x., p. 334), and *Darwinula stevensoni* from a somewhat similar deposit at the Meadows, Edinburgh (*see* Proc. Roy. Phys. Soc. Edin., vol. x., p. 141).

The following table, by showing what species are found in Scotland, but not in England, and *vice versâ*, may also be of interest.

TABLE II.

Species found in Scotland, but not hitherto known to occur in England.	Species found in England, but not hitherto known to occur in Scotland.
Scottia browniana[1] (T. R. Jones).	*Cypria joanna* (Baird).
Erpetocypris robertsoni, Brady and Norman.	*Cypris elliptica*, Baird.
Cyprois flava (Zaddach).	*Cypris cambrica*, Brady and Robertson.
Candona euplectella, Robertson.	*Cypris ornata*, O. F. Müller.
	Cypris clavata, Baird.
	Cypris trigonella, Brady.
	Erpetocypris serrata, Norman.
	Metacypris cordata, Brady and Robertson.
	Limnicythere monstrifica (Norman).

Table III. shows the species found both in England and Scotland, but not in Ireland, and those peculiar to Ireland only.

TABLE III.

Species found in both England and Scotland, but not hitherto in Ireland.	Species hitherto only found in Ireland.
Cyclocypris globosa (G. O. Sars).	*Cypris bispinosa*, Lucas.
Cypris obliqua, Brady.	*Candona elongata*, Brady and Norman.
Erpetocypris strigata (O. F. Müller).	
Erpetocypris tumefacta, Brady and Robertson.	
Erpetocypris olivacea, Brady and Norman.	
Cypridopsis newtoni, Brady and Robertson.	
Candona rostrata, Brady and Norman.	
Candona acuminata (Fischer).	
Ilyocypris gibba (Ramdohr).	
Lymnicythere inopinata (Baird).	

Though only two species are peculiar to the fresh-water Ostracod fauna of Ireland, they are both of special interest.

[1] *Scottia browniana* is found as a post-Tertiary fossil in several places in the south of England.

The first, *Cypris bispinosa*, is one of the finest of the British species, and the only other two places where it has been observed are the island of Guernsey and Egypt; while the second, *Candona elongata*, has been obtained nowhere else,—its Irish habitat being Lough Neagh.

Local Lists of Species.

The following lists of species are intended to exhibit how the Ostracoda vary in number and kinds in different localities in the district, and, also, to show that, while some forms are more or less common to all the localities, others are restricted to one or to only a few places. The lists may also be of use to collectors, by indicating where the rarer species may be obtained, and where the richest gatherings have been made. A few of the species mentioned in this paper are more frequently obtained in brackish than in purely fresh water, but they are included because of their close relationship with true fresh-water species. The true fresh-water and the true marine species merge together in these brackish-water forms, and any boundary line that may be drawn between the two is at best more or less arbitrary.

As Duddingston Loch is in our immediate vicinity, and has, so far, yielded a greater number of species than any other locality within the district, it may be better first to give a list of the Ostracoda that have been obtained in this loch.

Ostracoda obtained in Duddingston Loch, near Edinburgh.

Cypria ophthalmica (Jurine).
Cypria lævis (O. F. Müller).
Cypria serena (Koch).
Cypris fuscata (Jurine).
Cypris pubera, O. F. Müller.
Cypris virens (Jurine).
Cypris reticulata, Zaddach.
Erpetocypris reptans (Baird).
Erpetocypris strigata (O. F. Müller).
Erpetocypris tumefacta (Brady and Robertson).
Erpetocypris olivacea, Brady and Norman.
Cypridopsis vidua (O. F. Müller).
Cypridopsis villosa (Jurine).
Potamocypris fulva, Brady.
Cyprois flava (Zaddach).
Candona candida (O. F. Müller).
Candona lactea, Baird.
Candona pubescens (Koch).
Candona rostrata, Brady and Norman.
Candona fabæformis (Fischer).
Ilyocypris gibba (Ramdohr).
Limnicythere inopinata (Baird).

Ostracoda obtained in pools at LUFFNESS LINKS, near Aberlady. These pools have been long known to the botanist if not to the zoologist, and there can be no doubt that they harbour a micro-fauna fully as interesting as their flora. The following species were collected in September 1889:—

Cypria ophthalmica (Jurine).
Cypria lævis (O. F. Müller).
Cypris fuscata (Jurine).
Cypris virens (Jurine).
Erpetocypris reptans (Baird).
Erpetocypris tumefacta (Brady and Robertson).
Cypridopsis villosa (Jurine).
Notodromas monacha (O. F. Müller).
Candona candida (O. F. Müller).
Candona pubescens (Koch).
Candona kingsleii, Brady and Robertson.
Candona fabæformis (Fischer).
Ilyocypris gibba (Ramdohr).

THREIPMUIR RESERVOIR, two to three miles south of Balerno, is formed in one of the valleys of the Pentlands; the surrounding scenery has a rather bleak and barren appearance, especially towards the Pentlands. The reservoir is of considerable extent, and to make a careful examination of it would require the use of a boat, so that a tow-net and dredge could be used. If that were done it is quite possible that some interesting Entomostraca might be captured. I have only been able to make an examination of the sides of the reservoir with a hand-net, and the following were the Ostracoda obtained:—

Cypria ophthalmica (Jurine).
Cypria serena (Koch).
Cpyris fuscata (Jurine).
Erpetocypris tumefacta (Brady and Robertson).
Cypridopsis vidua (O. F. Müller).
Candona candida (O. F. Müller).
Candona kingsleii, Brady and Robertson.
Candona acuminata (Fischer).
Candona sp.

It sometimes happens that the ditches by which the surface water drains off into a loch or pond harbours a richer micro-fauna than the loch or pond to which they are tributaries. This was my experience at HARELAW DAM, which was visited about the same time as Threipmuir. The dam itself yielded very little in the way of Ostracoda, but in a ditch that for a considerable distance runs parallel

with the dam, I found the following species of Ostracoda, and one or two rare things belonging to another group :—

Cypria ophthalmica (Jurine).
Cypria serena (Koch).
Erpetocypris reptans (Baird).
Erpetocypris tumefacta (Brady and Robertson).
Cypridopsis vidua (O. F. Müller).
Cypridopsis villosa (Jurine).
Candona candida (O. F. Müller).
Candona kingsleii, Brady and Robertson.
Candona acuminata (Fischer).
Ilyocypris gibba (Ramdohr).

In company with an old friend—Mr Thomas Struthers—who is thoroughly familiar with the district around Edinburgh, I examined some pools near GOREBRIDGE in December 1889, and obtained the following species :—

Cypria ophthalmica (Jurine).
Erpetocypris tumefacta (Brady and Robertson).
Potamocypris fulva, Brady.
Candona candida (O. F. Müller).
Candona pubescens (Koch).
Candona kingsleii, Brady and Robertson.

At SEAFIELD, near Dunbar, there is an old disused brickfield in which are several pools of water. The brickfield is close to the sea-shore, so that during high tides the sea flows into the pools and causes the water to become brackish. The little shrimp-like Crustaceans, *Mysis vulgaris* and *Palæmonetes varians*, frequent some of the pools. Being desirous to learn about the Ostracod fauna of these pools, I got my friend Mr Jamieson, Assistant Naturalist to the Fishery Board, to collect some material and send it to me. I also, in company with him, made a personal examination of the pools. The following species of Ostracoda were obtained :—

Cypris prasina, Fischer.
Erpetocypris tumefacta (Brady and Robertson).
Cypridopsis aculeata, Lilljeborg.
Potamocypris fulva, Brady.
Candona candida (O. F. Müller).
Candona pubescens (Koch).
Ilyocypris gibba (Ramdohr).
Cytheridea torosa (Jones).

The brackish-water pools at the mouth of the COCKLEMILL BURN, near Largo, Fifeshire, were examined, and yielded the following species :—

Cypria ophthalmica (Jurine).
Cypris (?) *virens* (Jurine).
Potamocypris fulva, Brady.
Candona lactea, Baird.
Cytheridea torosa (Jones).

Along with the species enumerated from these two brackish-water localities, there were several others more nearly allied

to the marine than the fresh-water forms, which, though not entered in the regular lists, may be mentioned to show how the so-called marine and fresh-water species sometimes mingle together. The following are the species referred to:— *Cythere lutea*, Müller, *Cythere pellucida*, Baird, *Cythere villosa* (G. O. Sars), *Cythere albomacuta*, Baird, and *Cytherura gibba*, Müller. These were not dead shell, but were living in the pools along with the others. There were also some Foraminifera, as *Miliolina fusca*, *Lituola canariensis*, etc., associated with these Ostracoda.

Raith Lake, near Kirkcaldy, is an artificial lake, formed during last century. It is situated within the pleasure-grounds of the Raith estate, the property of Mr Munro-Ferguson, M.P., and is private. Permission to visit the loch may be obtained by applying to Mr Prentiss, the factor on the estate. This little lake harbours an abundant Crustacean fauna, especially Ostracoda and Cladocera. The loch is said to be 25 feet deep in some places, and to cover not less than 21 acres. The following are the species of Ostracoda obtained in Raith Lake in August 1890 :—

Cypria ophthalmica (Jurine).
Cypria serena (Koch).
Erpetocypris reptans (Baird).
Cypridopsis vidua (O. F. Müller).
Cypridopsis villosa (Jurine).
Potamocypris fulva, Brady.
Notodromas monacha (O. F. Müller).
Candona candida (O. F. Müller).
Candona lactea, Baird.
Candona rostrata, Brady and Norman.
Candona fabæformis (Fischer).
Ilyocypris gibba (Ramdohr).
Limnicythere inopinata (Baird).

Lindores Loch, near Newburgh, Fifeshire. Whether this little loch, which is situated in a district profoundly interesting to the student of old-world history, be to the zoologist or botanist a "happy hunting-ground" or not, it is certainly well known to, and much frequented, during the proper season, by the fraternity of the "roaring game." Often on the ice-bound surface of this loch the fate—not of kingdoms certainly but what is nearly of equal importance to those engaged in the contest—of the "clubs" of Fifeshire and of Perthshire, and sometimes of other shires as well, is decided for the year. It is easy for the onlooker to see by the gestures and ejaculations of the combatants that momentous issues are at stake. It is no wonder, then, that the humble seeker after Ostracods

and Copepods should desire to find out if there was anything of special interest to him in or about this famous loch. The following species rewarded my examination of it in July 1886. I have not been there since.

Cypria exculpta (S. Fischer).
Cypria ophthalmica (Jurine).
Cypria lævis (O. F. Müller).
Erpetocypris reptans (Baird).
Cypridopsis vidua (O. F. Müller).
Candona lactea, Baird.
Candona rostrata, Brady and Robertson.
Limnicythere inopinata (Baird).

The next list is that of the Ostracoda obtained in Loch Leven, Kinross-shire, in June 1890. (For a description of this loch see the *Ninth Annual Report of the Fishery Board for Scotland*, 1891.)

Cypria exculpta (Fischer).
Cypria ophthalmica (Jurine).
Cypria serena (Koch).
Erpetocypris reptans (Baird).
Erpetocypris strigata (O. F. Müller).
Erpetocypris tumefacta (Brady and Robertson).
Cypridopsis vidua (O. F. Müller).
Cypridopsis villosa (Jurine).
Potamocypris fulva, Brady.
Candona candida (O. F. Müller).
Candona lactea, Baird.
Candona kingsleii, Brady and Robertson.
Candona pubescens (Koch).
Ilyocypris gibba (Ramdohr).
Cytheridea lacustris (G. O. Sars).
Limnicythere sancti-patrici, Brady and Robertson.
Limnicythere inopinata (Baird).

On the 18th of September 1890, I visited Lochgelly Loch, Fifeshire, but, from want of time, was able to examine only a small part of it. The gathering then made was, however, rich in micro-crustacea, and showed that a thorough examination would, doubtless, have yielded satisfactory results. Nineteen species of Ostracoda were obtained at this time, as follows:—

Cypria exculpta (S. Fischer).
Cypria ophthalmica (Jurine).
Cypria lævis (O. F. Müller).
Cypris pubera, O. F. Müller.
Cypris obliqua, Brady.
Erpetocypris reptans (Baird).
Cypridopsis vidua (O. F. Müller).
Cypridopsis villosa (Jurine).
Potamocypris fulva, Brady.
Notodromas monacha (O. F. Müller).
Candona candida (O. F. Müller).
Candona lactea, Baird.
Candona pubescens (Koch).
Candona kingsleii, Brady and Robertson.
Candona fabæformis (Fischer).
Candona hyalina, Brady and Robertson.
Candona ambigua, Scott.
Ilyocypris gibba (Ramdohr).
Limnicythere inopinata (Baird).

Kilconquhar Loch, in the vicinity of Elie, Fifeshire, is a fine sheet of water. The sides are overgrown with vegetation, and appear to be a good hunting-ground for Entomostraca;

but no visitors are allowed near it, except on the north side, near the village of Kilconquhar. I visited the loch during September 1890, and obtained a fairly satisfactory gathering. The following Ostracoda were got:—

Cypria ophthalmica (Jurine).
Cypria lævis (O. F. Müller).
Cypris pubera, O. F. Müller.
Cypris virens (Jurine).
Erpetocypris reptans (Baird).
Erpetocypris tumefacta (Brady and Robertson).
Cypridopsis vidua (O. F. Müller).
Cypridopsis villosa (Jurine).
Potamocypris fulva, Brady.
Candona candida (O. F. Müller).
Candona lactea, Baird.
Candona kingsleii, Brady and Robertson.
Candona fabæformis (Fischer).
Ilyocypris gibba (Ramdohr).
Limnicythere inopinata (Baird).

KINGHORN LOCH, which is reached from Burntisland by the road that passes the "Oil Works," is close by the road-side and readily accessible. On the west side the ground is marshy, and harbours a few interesting species. Large and fine specimens of *Cypris pubera* were obtained at the time when I, along with my good friend Mr Bennie, visited the loch in September 1889. The following were the species gathered at that time:—

Cypria ophthalmica (Jurine).
Cypria lævis (O. F. Müller).
Cypris pubera, O. F. Müller.
Erpetocypris reptans (Baird).
Erpetocypris olivacea, Brady and Norman.
Potamocypris fulva, Brady.
Candona candida (O. F. Müller).
Candona lactea, Baird.
Candona pubescens (Koch).
Ilyocypris gibba (Ramdohr).

The BLACK LOCH, near Loch Glow, among the Cleish Hills, in the west of Fifeshire, was visited on the 14th September 1889, and yielded a few rare species. There are four little lochs here, in hollows among the hills, and they all appear to form suitable haunts for Entomostraca and other microscopic life. The following species were obtained in the Black Loch:—

Cypria ophthalmica (Jurine).
Cypria lævis (O. F. Müller).
Cyclocypris globosa (G. O. Sars).
Erpetocypris strigata (O. F. Müller).
Erpetocypris tumefacta, Brady and Robertson.
Erpetocypris olivacea, Brady and Norman.
Erpetocypris sp.
Cypridopsis vidua (O. F. Müller).
Cypridopsis villosa (Jurine).
Potamocypris fulva, Brady.
Candona candida (O. F. Müller).
Candona rostrata, Brady and Norman.
Candona kingsleii, Brady and Robertson.
Ilyocypris gibba (Ramdohr).
Limnicythere inopinata (Baird).

Classified List of Ostracoda obtained in the District around Edinburgh.

The following classified list includes all the genera and species known to occur in the district, and they are all represented in my collection. In order to make the list useful to those who may not possess the more recent literature on the Ostracoda, I have added a few synonyms; and for further information would refer the reader to the "Monograph of the Marine and Fresh-Water Ostracoda of the North Atlantic and of North-Western Europe," Section I., "Podocopa," by Professor G. S. Brady and the Rev. Canon Norman.

Family Cypridid æ.

This family includes all but a few of the fresh-water species.

Genus Cypria, Zenker (1854).

Cypria exculpta (S. Fischer, 1854).

1868. *Cypris striolata*, Brady, Mon. Brit. Ostrac., p. 372, pl. xxiv., figs. 6-10.
1880. *Cypris granulata*, Robertson, Fresh and Brackish Water Ostrac. of Clydesdale, p. 18 (young).
1889. *Cypria exculpta*, Brady and Norman, Mon. Ostrac. N. Atlantic and N.-W. Europe, p. 68, pl. xi., figs. 1-4.

Habitat.—Loch Leven, Kinross-shire; Lindores Loch, Lochgelly Loch, Lurg Loch, and Loch Dow, Fifeshire. Frequent.

Cypria ophthalmica (Jurine, 1820).

1835. *Cypris compressa*, Baird, Trans. Berw. Nat. Club, vol. i., p. 100, pl. iii., fig. 16.
1868. *Cypris compressa*, Brady, *op. cit.*, p. 372, pl. xxiv., figs. 1-5; pl. xxxvi., fig. 6.
1875. *Cypris compressa*, Brady, Crosskey, and Robertson, Post-Tert. Entom., p. 127, pl. i., figs. 5, 6.
1889. *Cypria ophthalmica*, Brady and Norman, *op. cit.*, p. 691, pl. xi., figs. 5-9.

Habitat.—Common throughout the district.

Cypria lævis (O. F. Müller, 1785).

1820. *Monoculus ovum*, Jurine, Hist. de Monocles, p. 179, pl. xix., figs. 18, 19.
1835. *Cypris minuta*, Baird, Brit. Entom., p. 155, pl. xviii., figs. 7, 8.
1868. *Cypris ovum*, Brady, *op. cit.*, p. 373, pl. xxiv., figs. 33, 34, 43-45; pl. xxxiv., fig. 8.
1875. *Cypris ovum*, Brady, Crosskey, and Robertson, *op. cit.*, p. 123, pl. i., figs. 5, 6.
1889. *Cypria lævis*, Brady and Norman, *op. cit.*, p. 69.

Habitat.—Frequent throughout the district.

Cypria serena (Koch, 1838).

1868. *Cypris lævis*, Brady, *op. cit.*, p. 374, pl. xxiv., figs. 6-8.
1875. *Cypris lævis*, Brady, Crosskey, and Robertson, *op. cit.*, p. 126, pl. i., figs. 25-28.
1889. *Cypria serena*, Brady and Norman, *op. cit.*, p. 70.

Habitat.—Generally distributed throughout the district.

Genus **Cyclocypris**, Brady and Norman (1889).

Cyclocypris globosa (G. O. Sars, 1863).

1868. *Cypris cinerea*, Brady, *op. cit.*, p. 374, pl. xxiv., figs. 39-42; pl. xxxvi., fig. 7.
1875. *Cypris cinerea*, Brady, Crosskey, and Robertson, *op. cit.*, p. 126, pl. ii., figs. 6, 7.
1889. *Cyclocypris globosa*, Brady and Norman, *op. cit.*, p. 71, pl. xiv., figs. 1, 2; pl. xi., figs. 10-18.

Habitat.—Loch Leven; Loch Fitty, Fifeshire; Black Loch and Loch Dow.

Genus **Cypris**, Müller (1785).

Cypris fuscata, Jurine (1820).

1868. *Cypris fusca*, Brady, *op. cit.*, p. 362, pl. xxiii., figs. 10-15.
1889. *Cypris fuscata*, Brady and Norman, *op. cit.*, p. 73, pl. xii., figs. 3, 4.

Habitat.—Duddingston Loch, ponds at the Braid Hills, Edinburgh; ponds near Dunbar; and Loch Fitty, Fifeshire.

Cypris incongruens, Ramdohr (1808).

1868. *Cypris incongruens*, Brady, *op. cit.*, p. 362, pl. xxiii., figs. 16-22.
1889. *Cypris incongruens*, Brady and Norman, *op. cit.*, p. 73, pl. xii., figs. 8, 9.

Habitat.—Brickfields at Portobello; side of the Union Canal at Slateford; May Island.

Cypris pubera, O. F. Müller (1785).

1868. *Cypris punctillata*, Brady, *op. cit.*, p. 365, pl. xxvi., figs. 1-7; pl. xxxvi., fig. 11.
1889. *Cypris pubera*, Brady and Norman, *op. cit.*, p. 74.

Habitat.—Duddingston Loch, Edinburgh; Kilconquhar Loch, Kinghorn Loch, Lochgelly Loch, Fifeshire.

Cypris virens (Jurine, 1820).

1868. *Cypris virens*, Brady, *op. cit.*, p. 364, pl. xxiii., figs. 23-32; pl. xxxvi., fig. 1.
1889. *Cypris virens*, Brady and Norman, *op. cit.*, p. 74.

Habitat.—Frequent throughout the district—Duddingston Loch, pools at Luffness Links (large and fine specimens), pools at Slateford, Kilconquhar Loch.

Cypris reticulata, Zaddach (1844).

1868. *Cypris tessellata*, Brady (in part), *op. cit.*, p. 336, pl. xxiii., figs. 39-45.
1880. *Cypris tessellata*, Robertson, Fresh and Brackish Water Ostrac. of Clydesdale, p. 15.
1889. *Cypris reticulata*, Brady and Norman, *op. cit.*, p. 76, pl. viii., figs. 1, 2; pl. xi., figs. 5-7.

Habitat.—Camilla Loch, Fifeshire (August 20, 1890); Duddingston Loch (April 8, 1893).

Cypris obliqua, Brady (1868).

1889. *Cypris obliqua*, Brady and Norman, *op. cit.*, p. 77, pl. xii., fig. 10.

Habitat.—Lurg Loch (near Loch Glow), Kinross-shire; Lochgelly Loch, Fifeshire. The colour of the shell of this species from these two localities was a fine, light, chocolate-brown; the colour of the shells of the same species from a

tarn near Cragengower Farm, Cumbrae, was bright green (Robertson).

Cypris prasina, Fischer (1855).

1850. *Cypris strigata*, Baird, Brit. Entom., p. 157 (not *C. strigata*, Müller).
1868. *Cypris salina*, Brady, *op. cit.*, p. 368, pl. xxvi., figs. 8-13.
1889. *Cypris prasina*, Brady and Norman, *op. cit.*, p. 78.

Habitat.—Pools in an old brickfield at Seafield, near Dunbar, August 1890.

Genus **Erpetocypris**, Brady and Norman (1889).

Erpetocypris reptans (Baird, 1835).

1850. *Candona similis*, Baird, Brit. Entom., p. 162, pl. xix., figs. 2-2*a* (young).
1868. *Cypris reptans*, Brady, *op. cit.*, p. 370, pl. xxv., figs. 10-14; pl. xxxvi., fig. 4.
1889. *Erpetocypris reptans*, Brady and Norman, *op. cit.*, p. 84, pl. xiii., fig. 27.

Habitat.—More or less common throughout the district.

Erpetocypris strigata (O. F. Müller, 1785).

1889. *Erpetocypris strigata*, Brady and Norman, *op. cit.*, p. 85, pl. viii., figs. 14, 15.

Habitat.—Duddingston Loch, common; Loch Leven, rare; Black Loch (near Loch Glow), 14th September 1889.

Erpetocypris tumefacta (Brady and Robertson).

1870. *Cypris tumefacta*, Brady and Robertson, Ann. and Mag. Nat. Hist., ser. iv., vol. vi., p. 13, pl. iv., figs. 4-6.
1889. *Erpetocypris tumefacta*, Brady and Norman, *op. cit.*, p. 87, pl. viii., figs. 5-7; pl. xiii., fig. 18.

Habitat.—Duddingston Loch, and several other places within the district.

Erpetocypris olivacea, Brady and Norman.

1889. *Erpetocypris olivacea*, Brady and Norman, *op. cit.*, p. 89, pl. i., figs. 3, 4.

Habitat.—Duddingston Loch, not very common; Kinghorn Loch, rare; Black Loch (near Loch Glow), scarce.

Genus **Cypridopsis**, Brady.

Cypridopsis vidua (O. F. Müller, 1785).

1868. *Cypridopsis vidua*, Brady, *op. cit.*, p. 375, pl. xxiv., 27-36, 46.
1889. *Cypridopsis vidua*, Brady and Norman, *op. cit.*, p. 89.

Habitat.—Generally distributed throughout the district.

Cypridopsis aculeata (Lilljeborg, 1853).

1868. *Cypridopsis aculeata*, Brady, *op. cit.*, p. 376, pl. xxiv., figs. 16-20; pl. xxxvi., fig. 10.
1889. *Cypridopsis aculeata*, Brady and Norman, *op. cit.*, p. 90.

Habitat.—Pools in an old brickfield at Seafield, near Dunbar.

Cypridopsis villosa (Jurine, 1820).

1868. *Cypridopsis villosa*, Brady, *op. cit.*, p. 377, pl. xxiv., figs. 11-15; pl. xxxvi., fig. 9.

Habitat.—Generally distributed throughout the district, but not so common as *Cypridopsis vidua*.

Genus **Potamocypris**, Brady (1870).

Potamocypris fulva, Brady.

1889. *Potamocypris fulva*, Brady and Norman, *op. cit.*, p. 93, pl. xxii., figs. 13-17.

Habitat.—Generally distributed throughout the district; and moderately common in some localities, as in marshy ground at Gorebridge, and at Raith Lake, Kirkcaldy.

Genus **Notodromas**, Lilljeborg (1853).

Notodromas monacha (O. F. Müller), 1785.

1889. *Notodromas monacha*, Brady and Norman, *op. cit.*, p. 96.

Habitat.—Luffness Links, near Aberlady; Lochgelly Loch and Camilla Loch, Fifeshire. Frequent in all the three localities.

Genus Cyprois, Zenker (1854).

Cyprois flava (Zaddach).

1838. (?) *Cypris gibbosa*, Baird, Mag. Zool. and Bot., vol. ii., p. 137, pl. v., fig. 15.
1844. *Cypris flava*, Zaddach, Syn. Crust. Prus. Prodr., p. 33.
1850. *Cypris gibbosa*, Baird, Brit. Entom., p. 156, pl. xix., fig. 8.
1854. *Cyprois dispar*, Zenker, Mon. der Ostrac. (Archiv für Naturgesch.), p. 18.
1889. *Cyprois flava*, Brady and Norman, *op. cit.*, p. 97, pl. viii., figs. 18, 19; pl. xii., figs. 13-21, 38.

Habitat.—Duddingston Loch, upper end, common (1889). Mr David Robertson has obtained this species in Burnside Loch, near Rutherglen. It is thought that the *Cypris gibbosa* of Dr Baird is, probably, this species, and, if so, his name ought to have precedence of the other. Dr Baird's figure of *Cypris gibbosa* is, certainly, very different from the specimens of *Cyprois flava* obtained in Duddingston Loch. He also describes the shell as "much elevated on the upper margin, the centre exhibiting a large gibbosity or hump," and also as being "of a light green colour"—characters which do not very closely agree with the Duddingston specimens.

Genus Candona, Baird (1845).

Candona candida (O. F. Müller, 1785).

1889. *Candona candida*, Brady and Norman, *op. cit.*, p. 98, pl. x., figs. 1, 2, 14-23.

Habitat.—Generally distributed, and common throughout the district.

Candona lactea, Baird.

1868. *Candona lactea*, Brady, Mon. rec. Brit. Ostrac., p. 382, pl. xxiv., figs. 55-58.
1868. *Candona detecta*, idem, ibidem (var.), p. 384, pl. xxiv., figs. 35-38; pl. xxxvii., fig. 2.
1889. *Candona lactea*, Brady and Norman, *op. cit.*, p. 100.

Habitat.—Generally distributed, but not so common as the last. The young of *Candona candida*, which is a very variable species, are sometimes apt to be mistaken for

Candona lactea; careful discrimination is, therefore, necessary. *Candona lactea* is somewhat cylindrical in shape, moderately robust, and with the ends evenly rounded.

Candona pubescens (Koch).

1837. *Cypris pubescens*, Koch, Deutschlands Crustaceen, H. 11, p. 5.
1838. (?) *Cypris compressa*, idem, ibidem, H. 21, p. 17.
1868. *Candona compressa*, Brady, Mon. rec. Brit. Ostrac., p. 382, pl. xxvi., figs. 22-27.
1868. *Candona albicans* idem, ibidem, p. 381, pl. xxv., figs. 20-25; pl. xxxvi., fig. 12.
1889. *Candona pubescens*, Brady and Norman, *op. cit.*, p. 101, pl. xii., figs. 32-37.

Habitat.—Duddingston Loch, Loch Leven, Luffness Links, Kinghorn Loch, brackish-water pools in an old brickfield near Dunbar.

Candona rostrata, Brady and Norman.

1889. *Candona rostrata*, Brady and Norman, *op. cit.*, p. 101, pl. ix., figs. 11, 12, 12*a* and *b*; pl. xii., figs. 22-31.

Habitat.—Duddingston Loch, Raith Lake, Lurg Loch, Lindores Loch. Not very common.

Candona kingsleii, Brady and Robertson.

1870. *Candona kingsleii*, Brady and Robertson, Ann. and Mag. Nat. Hist., ser. iv., vol. vi., p. 17, pl. ix., figs. 9-12.
1889. *Candona kingsleii*, Brady and Norman, p. 102, pl. ix., figs. 19-22; pl. xiii., fig. 19.

Habitat.—Generally distributed. Frequent in Duddingston Loch.

Candona fabæformis (Fischer, 1851).

1870. *Candona diaphana*, Brady and Robertson, Ann. and Mag. Nat. Hist., ser. iv., vol. vi., p. 18, pl. v., figs. 1-3.
1889. *Candona fabæformis*, Brady and Norman, *op. cit.*, p. 103, pl. ix., figs. 1-4.

Habitat.—Duddingston Loch, frequent; pond on north side of Corstorphine Hill, common; Luffness Links; Loch Fitty; etc.

Candona acuminata (Fischer, 1851).

1889. *Candona acuminata*, Brady and Norman, *op. cit.*, p. 104, pl. ix., figs. 9, 10; pl. x., figs. 5, 6.

Habitat. — Ditch beside Harelaw Dam; Threipmuir Reservoir, Balerno; Loch Fitty, Fifeshire. Not common.

Candona euplectella, Robertson.

1880. *Candona euplectella*, Robertson, Fresh and Brackish Water Ostracoda of Clydesdale, etc., p. 23.
1889. *Candona euplectella*, Brady and Norman, *op. cit.*, p. 105, pl. ix., figs. 7, 8, 8*a*.

Habitat.— Loch Dow, near Loch Glow, Kinross-shire, 14th September 1889. Rather rare.

Candona hyalina, Brady and Robertson.

1870. *Candona hyalina*, Brady and Robertson, Ann. and Mag. Nat. Hist., ser. iv., vol. vi., p. 18, pl. ix., figs. 5-8; pl. v., figs. 4-11.
1889. *Candona hyalina*, Brady and Norman, *op. cit.*, p. 247 (woodcuts of ♂).

Habitat.—Threipmuir Reservoir, near Balerno (♂); Loch Fitty, Fifeshire; Loch Dow, near Loch Glow, Kinross-shire (♀).

Candona ambigua, Scott.

1891. *Candona ambigua*, Scott, Invert. Fauna of Inland Waters of Scot. (Ninth Annual Report of the Fishery Board for Scotland), p. 277, pl. iv., figs. 7*a-c*.

Habitat.—Lochgelly Loch and Loch Fitty, Fifeshire. Not common.

Genus **Ilyocypris**, Brady and Norman (1889).

Ilyocypris gibba (Ramdohr, 1808).

1868. *Cypris gibba*, Brady, *op. cit.*, p. 369, pl. xxiv., figs. 47-54; pl. xxxvi., fig. 2.
1889. *Ilyocypris gibba*, Brady and Norman, *op. cit.*, p. 107, pl. xxii., figs. 1-5.

Habitat.—Duddingston Loch, 1888; vicinity of Gorebridge, 1889; Kinghorn Loch, 1889; Kilconquhar Loch, 1890; Loch Leven, 1890; Lochgelly Loch, 1890.

Family CYTHERIDÆ.

Genus **Limnicythere**, Brady (1867).

Limnicythere inopinata (Baird, 1850).

1868. *Limnicythere inopinata*, Brady, *op. cit.*, p. 419, pl. xxix., figs. 15-18.
1889. *Limnicythere inopinata*, Brady and Norman, *op. cit.*, p. 170, pl. xvii., figs. 18, 19 (var. *compressa*).

Habitat.—Duddingston Loch, 1889; Loch Leven, 1890; Lindores Loch, 1886; Kilconquhar Loch, 1890; Raith Lake, 1890; Lochgelly Loch, 1890; etc.

Limnicythere sancti-patrici, Brady and Robertson, 1869.

1889. *Limnicythere sancti-patrici*, Brady and Norman, *op. cit.*, p. 171, pl. xvii., figs. 1, 2.

Habitat.—Loch Leven, Kinross-shire, 1890. (Obtained in a post-Tertiary deposit at Holyrood—see *Proc. Roy. Phys. Soc.*, vol. x., p. 143, 1889.)

Genus **Cytheridea**, Bosquet, 1850.

Cytheridea lacustris (G. O. Sars, 1862).

1889. *Cytheridea lacustris*, Brady and Norman, *op. cit.*, p. 176.

Habitat. — Loch Leven, frequent, 1890; canal near Morningside, Edinburgh (David Robertson).

Cytheridea torosa (Jones, 1850).

1868. *Cytheridea torosa*, Brady, *op. cit.*, p. 425, pl. xxviii., figs. 7-12; pl. xxxix., fig. 5.
1889. *Cytheridea torosa*, Brady and Norman, *op. cit.*, p. 175.

Habitat.—Brackish-water pools at the mouth of the Cockle-mill Burn, near Largo, July 1890; brackish-water pools in an old brickfield at Seafield, near Dunbar, August 1890.

The preceding list of Ostracoda contains thirty-six species belonging to twelve genera; and it is not improbable that, owing to the erratic distribution of the group, the list may be still further increased when the district has been more thoroughly examined.

THE COPEPODA.

I shall now proceed to give a short account of the Copepoda of the district.

This group is equally interesting with the preceding one, but rather more difficult to deal with; they want the hard shell-like covering of the Ostracoda, which allows of those organisms being conveniently mounted and preserved as cabinet specimens. The only manner in which the Copepoda can be preserved is by mounting them in balsam, or some other suitable medium, or by keeping them in methylated spirits; yet, notwithstanding this difficulty, they form a very profitable leisure-time study.

The distribution of the Copepoda is, perhaps, not so capricious as that of the Ostracoda, yet here, as in the other group, we meet with examples of special interest. I shall mention one or two of these. In 1892 I had an opportunity of making an examination of Loch Morar,[1] in Inverness-shire, and obtained a number of rare Entomostraca; but, though the Copepoda were numerously represented, not a single specimen of *Canthocamptus minutus* was observed, and this is one of the most common of the fresh-water *Harpacticidæ*. I do not, of course, mean to say that this species was entirely absent, but only, that, though a careful examination of the material collected was made (partly to ascertain if this *Canthocamptus* was present), no specimens were obtained. In the *Journal of Microscopical Science* for 1868, Professor G. S. Brady described a small species of Copepod, specimens of which had been sent to him by Mr Atthey. They had been found by Mr Atthey "living amongst films of gelatinous algæ" on "the damp roof of the pit-workings of the low main, West Cramlington Colliery, near Newcastle," and the species was named *Attheyella cryptorum*, after its discoverer. The locality described appeared to be the only known habitat of the species till last year, when it was obtained in Loch Morar, in material collected by dragging a small tow-net

[1] An account of this loch will be found in the Annual Report of the Fishery Board for Scotland for 1893.

through the plants and algæ in the shallow water at the head of the loch. It has been obtained, more recently, in material, collected by hand-net, from a ditch in the neighbourhood of Harelaw Dam, Balerno, near Edinburgh, and also in Duddingston Loch.

Equally interesting is the distribution of *Diaptomus serricornis*, Lilljeborg. This species was not known to be a member of the British fauna till it was discovered in tow-net gatherings from Loch Mullach, Corrie, Sutherlandshire, collected by Mr W. S. Caine.[1] After its discovery in this loch, it was ascertained that Mr David Robertson had taken the same species in a pond, near Lerwick, in 1867, but it had remained since that time unnoticed in print. At present the only known British habitats for *Diaptomus serricornis* are the two places here mentioned. It occurs "in fresh-water lakes at Lumbowski in Russian Lapland," and this, so far, is the only European district where it has been obtained, unless *Diaptomus wierzejskii*, Richard, be held as being merely a local variety of *Diaptomus serricornis* (and really the difference between these two forms seems to be so very small that they can hardly be considered as specifically distinct). *Diaptomus wierzejskii* has been recorded from Spain (neighbourhoods of Madrid and Valladolid) and from Saxony. If, therefore, we are to consider these two forms as belonging to the one species, its known distribution is thus of considerable extent, and may indicate that, though it is only recorded from a few localities, it will yet be found of more frequent occurrence than is apparent at present.

The following lists of Copepoda from a few of the principal places within the district, will help to show how this group is locally distributed, and how different species are associated together. These local lists are not to be considered exhaustive, but simply as an effort to bring together the species that have been obtained in the various localities, and thus far satisfactorily determined. The first list will be that of the species obtained in the loch at Duddingston—a loch that has

[1] See Scottish Naturalist for October 1891, p. 172; also A Revision of the British Species of Fresh-Water Cyclopidæ and Calanidæ, by Professor Brady, p. 36 (1891).

from time immemorial been the resort of both the zoologist and botanist. The names of not a few who have been eminent in one or other of these departments could be given who have been interested in the fauna and flora of Duddingston Loch.

Copepoda obtained in DUDDINGSTON LOCH:

Diaptomus gracilis, G. O. Sars.
Cyclops signatus, Koch.
Cyclops bicuspidatus, Claus.
Cyclops thomasi, Forbes.
Cyclops viridis (Jurine).
Cyclops serrulatus, Fischer.
Cyclops phaleratus, Koch.
Cyclops fimbriatus, Fischer.
Canthocamptus minutus (Müller).
Canthocamptus northumbricus, Brady.
Attheyella spinosa, Brady.
Attheyella cryptorum, Brady.

LOCH LEVEN, KINROSS-SHIRE.—In 1890 I found *Cyclops* very abundant in this loch, but only a few species were obtained, as shown by the following list. The other fresh-water groups were also very sparingly represented.

Diaptomus gracilis, G. O. Sars.
Cyclops signatus, Koch.
Cyclops strenuus, Fischer.
Cyclops vicinus,[1] Uljanin.
Cyclops serrulatus, Fischer.
Cyclops fimbriatus, Fischer.
Canthocamptus minutus (Müller).
Attheyella spinosa, Brady.

RAITH LAKE, KIRKCALDY.—This loch, though comparatively of small size, yielded several interesting species. It is well worth a visit, not only on account of its abundant micro-fauna, but also because of its beautiful and picturesque surroundings.

The Copepoda obtained in this little loch were as follows:—

Diaptomus gracilis, G. O. Sars.
Cyclops signatus, Koch.
Cyclops viridis (Jurine).
Cyclops serrulatus, Fischer.
Cyclops affinis, G. O. Sars.
Cyclops phaleratus, Koch.
Cyclops fimbriatus, Fischer.
Canthocamptus minutus, Müller.

LOCHGELLY LOCH.—The following species of Copepoda were obtained in Lochgelly Loch:—

Diaptomus gracilis, G. O. Sars.
Cyclops signatus, Koch.
Cyclops phaleratus, Koch.
Cyclops serrulatus, Fischer.
Cyclops thomasi, Forbes.
Cyclops viridis (Jurine).
Cyclops fimbriatus, Fischer.
Canthocamptus minutus (Müller).
Attheyella spinosa, Brady.

[1] See Prof. Brady's Revision of the British Cyclopidæ and Calanidæ, p. 12 (1891).

Classified List of the Copepoda obtained in the District around Edinburgh.

Family Calanidæ.

Genus **Diaptomus**, Westwood (1836).

Diaptomus castor (Jurine).

1785. *Cyclops cæruleus*, Müller, Entomostraca, p. 102, pl. xv., figs. 1-9.
1820. *Monoculus castor*, Jurine, Hist. des Monoc., p. 50, pls. iv.-vi.
1850. *Diaptomus castor*, Baird, Brit. Entom., p. 219, pl. xxvi.
1891. *Diaptomus castor*, Brady, Revision of the Brit. Sp. of F.-W. Cyclop. and Calanidæ, p. 27, pl. xi., figs. 1-6.

Habitat.—Braid Ponds, near Edinburgh, August 1888.[1]

Diaptomus gracilis, G. O. Sars.

1863. *Diaptomus gracilis*, G. O. Sars, Videnskabsselsk. Forhandl., 1862, p. 9.
1863. *Diaptomus westwoodii*, Lubbock, Trans. Linn. Soc., vol. xxiv., p. 203, pl. xxxi., figs. 1-6.
1888. *Diaptomus graciloides*, Lilljeborg, Bull. Soc. Zool. de France, xiii., p. 156.
1889. *Diaptomus graciloides*, De Guerne and Richard, Revision des Calanides d'eau douce, p. 36, pl. i., figs. 26, 27.
1889. *Diaptomus gracilis*, idem, ibidem, p. 14, pl. ii., figs. 12, 16, 20.
1891. *Diaptomus gracilis*, Brady, *op. cit.*, p. 29, pl. xi., figs. 7-9; pl. xii., figs. 1-8.

Habitat.—Generally distributed throughout the district.

Genus **Eurytemora**, Giesbrecht (1881).

Eurytemora clausii (Hoek).

1876. *Temora clausii*, Hoeck, Tijdsch. d. Nederl. Dierkund., Vereenig iii., p. 23, pls. iv. and v.
1878. *Temora velox*, Brady, Mon. Brit. Copep., vol. i., p. 56, pl. vi., figs. 1-5.
1889. *Eurytemora lacinulata*, De Guerne and Richard, *op. cit.*, p. 82, figs. 44, 45.
1891. *Eurytemora clausii*, Brady, Revision of the Brit. Sp. of F.-W. Cyclop. and Calan., p. 40, pl. xiii., figs. 1-5.

Habitat.—Brackish-water pools in an old brickfield at Seafield, near Dunbar, August 1890; in brackish-water

[1] Ann. Scot. Nat. Hist., p. 202 (1892).]

pools at Seafield, near Leith, 1892; brackish-water pools by the shore at Aberlady, 5th September 1889.

Eurytemora affinis (S. A. Poppe).

1881. *Temora affinis*, Poppe, Abhandl. des Naturw. ver Bremen, vi., p. 55, pl. iii., figs. 1-14.
1889. *Eurytemora affinis*, De Guerne and Richard, *op. cit.*, p. 84, figs. 46, 47.
1891. *Eurytemora affinis*, Brady, Revision Brit. F.-W. Cyclop. and Calanid., p. 42, pl. xiii., figs. 6-9.

Habitat.—Forth, about Culross and Alloa. Common.

Family Cyclopidæ.

Genus Cyclops, Müller (1785).

Cyclops signatus, Koch.

1841. *Cyclops signatus*, Koch, Deutschlands Crustaceen, etc., H. 21, tab. viii. (antenna with serrated ridge).
1857. *Cyclops tenuicornis*, Claus, Weigmann's Archiv., p. 21, pl. iii., figs. 1-11 (antenna with simple ridge).
1891. *Cyclops signatus*, Brady, *op. cit.*, p. 6, pl. ii., fig. 5.

Habitat.—Duddingston Loch (ridge simple); Cocklemill Burn, near Largo (ridge simple and serrated); Raith Lake (ridge simple); Loch Leven (ridge simple); Lochgelly Loch (ridge simple); Kinghorn Loch (ridge simple); pools at Luffness Links (ridge simple).

Cyclops strenuus, Fischer.

1851. *Cyclops strenuus*, Fischer, Bull. Soc. imp. Moscou., p. 419, pl. ix., figs. 12-21.
1891. *Cyclops strenuus*, Brady, *op. cit.*, p. 8, pl. ii., figs. 1-4.

Habitat.—Loch Leven, Kinross-shire, common; Loch Fitty, Fifeshire; Cocklemill Burn, near Largo.

Cyclops vicinus, Uljanin.

1875. *Cyclops vicinus*, Uljanin, Crustacea of Turkestan, p. 30, pl. x., figs. 1-7; pl. xii., figs. 7-9.
1878. *Cyclops pulchellus*, Brady, Mon. Brit. Copep., p. 107, pl. xvii., figs. 1-3.
1891. *Cyclops vicinus*, Brady, Revision Brit. F.-W. Cyclop. and Calanid., p. 12, pl. i., figs. 6-9.

Habitat.—Loch Leven, Kinross; Cocklemill Burn, near Largo; Kinghorn Loch, Fifeshire.

Cyclops bicuspidatus, Claus.

1857. *Cyclops bicuspidatus*, Claus, Weigmann's Archiv., p. 209, pl. xi., figs. 6, 7.
1891. *Cyclops bicuspidatus*, Brady, *op. cit.*, p. 13, pl. v., figs. 1-5.

Habitat.—Duddingston Loch.

Cyclops thomasi, Forbes.

1882. *Cyclops thomasi*, Forbes, American Naturalist, vol. xvi., p. 640, pl. ix., figs. 10, 11, 16.
1891. *Cyclops thomasi*, Brady, *op. cit.*, p. 15, pl. vi., figs. 1-4.

Habitat. — Duddingston Loch, Lochgelly Loch, Camilla Loch.

Cyclops viridis (Jurine).

1820. *Monoculus quadricornis viridis*, Jurine, Hist. des Monoc., p. 46, pl. iii., fig. 1.
1857. *Cyclops brevicornis*, Claus, Weigmann's Archiv., pl. iii., figs. 12-17.
1857. *Cyclops gigas*, *ibid.*, p. 207, pl. xi., figs. 1-5.
1891. *Cyclops viridis*, Brady, *op. cit.*, p. 17, pl. v., figs. 6-10.

Habitat.—Generally distributed throughout the district. Duddingston Loch; Loch Leven, Kinross-shire; etc.

Cyclops serrulatus, Fischer.

1838. *Cyclops serrulatus*, Fischer, Bull. Soc. imp. Moscou., p. 423 pl. x., figs. 22, 23, 26-31.
1891. *Cyclops serrulatus*, Brady, *op. cit.*, p. 18, pl. vii., fig. 1.

Habitat.—Generally distributed throughout the district. Colour of ovisacs very variable—blue, reddish, green.

Cyclops affinis, G. O. Sars.

1863. *Cyclops affinis*, G. O. Sars, Videnskabsselsk. Forhandl., 1862, p. 47.
1891. *Cyclops affinis*, Brady, *op. cit.*, p. 21, pl. viii., figs. 1-6.

Habitat.—Raith Lake, Kirkcaldy; Black Loch, near Loch Glow, Kinross-shire.

Cyclops ewarti, G. S. Brady.

1888. *Cyclops ewarti*, Brady, Sixth Annual Report of the Fishery Board for Scotland, p. 232, pl. viii. figs. 1-6.
1891. *Cyclops ewarti*, Brady, Revision Brit. F.-W. Cyclop. and Calanidæ, p. 22, pl. vii., figs. 4-7.

Habitat.—Forth estuary, west of Queensferry, near the mouth of the Ironmill Burn. (Loch Morar, a fresh-water loch in Inverness-shire.)

Cyclops phaleratus, Koch.

1841. *Cyclops phaleratus*, Koch, Deutschlands Crustaceen, etc., H. 21, tab. ix.
1891. *Cyclops phaleratus*, Brady, *op. cit.*, p. 25, pl. ix., fig. 2.

Habitat.—Duddingston Loch; Raith Lake, Kirkcaldy; Black Loch, near Loch Glow, Kinross-shire.

Cyclops fimbriatus, Fischer.

1785. *Cyclops crassicornis*, Müller, Entomostraca, p. 113, pl. xviii., figs. 15-17.
1853. *Cyclops fimbriatus*, Fischer, Bull. Soc. imp. Moscou., p. 94, pl. iii., figs. 19-28, 30.
1878. *Cyclops crassicornis*, Brady, Mon. Brit. Copep., vol. i., p. 118, pl. xxiii., figs. 1-6.
1891. *Cyclops fimbriatus*, Brady, Revision Brit. F.-W. Cyclop. and Calanidæ, p. 25, pl. ix., fig. 1.

Habitat.—Generally distributed throughout the district. Duddingston Loch; in a small spring among the rocks on the side of Arthur's Seat above the "Targets"; Raith Lake, Kirkcaldy; Loch Fitty; ditch in the vicinity of Harelaw Dam, Balerno, near Edinburgh, etc.

Cyclops æquoreus, Fischer.

1860. *Cyclops æquoreus*, Fischer, *op. cit.*, p. 654, pl. xx., figs. 26-29.
1878. *Cyclops æquoreus*, Brady, Mon. Brit. Copep., vol. i., p. 119, pl. xix., figs. 8-10; pl. xxi., figs. 10-17.
1891. *Cyclops æquoreus*, Brady, Revis. Brit. F.-W. Cyclop. and Calanidæ, p. 26, pl. x., fig. 1.

Habitat.—Brackish-water pools at high-water mark, Cramond Island, Firth of Forth.

Family HARPACTICIDÆ.

Genus **Canthocamptus**, Westwood (1836).

Canthocamptus minutus (Müller).

1776. *Cyclops minutus*, Müller, Zool. Dan. Prod., Entom., p. 101, pl. xvii., figs.
1785. *Cyclops minutus*, idem, Entom., p. 101, pl. xvii., figs. 1-7.
1850. *Canthocamptus minutus*, Baird, Brit. Entom., p. 204, pl. xxv., figs. 4-8; pl. xxx., fig. 3.
1880. *Canthocamptus minutus*, G. S. Brady, Brit. Copep., vol. ii., p. 48, pl. xliv., figs. 1-17.

Habitat.—Generally distributed throughout the district. Duddingston Loch, frequent; Black Loch and Lurg Loch, near Loch Glow, Kinross-shire; Camilla Loch, Raith Lake, and Lochgelly Loch, Fifeshire; Loch Leven, Kinross-shire. Ovisac large, pale blue.

Canthocamptus northumbricus, Brady.

1880. *Canthocamptus northumbricus*, Brady, *op. cit.*, vol. ii., p. 57, pl. xlv., figs. 1-14.

Habitat.—Duddingston Loch. This is distinguished from *Canthocamptus minutus* by the inner branches of the second, third, and fourth pairs of swimming feet being two-jointed. It is also smaller. The second and third joints of the inner branches of the first swimming feet are proportionally shorter. Ovisac smaller, proportionally; colour whitish, with a tinge of red.

Canthocamptus palustris, Brady.

1880. *Canthocamptus palustris*, Brady, Mon. Brit. Entom., vol. ii., p. 53, pl. xxxix., figs. 13-23.

Habitat.—Pools on May Island, August 1890.

Genus **Attheyella**, Brady (1880).

Attheyella spinosa, Brady.

1880. *Attheyella spinosa*, Brady, *op. cit.*, vol. ii., p. 58, pl. xliii., figs. 15-18; pl. xlvi., figs. 13-18.

Habitat.—Duddingston Loch; Kilconquhar Loch; Black Loch, near Dunbar; Lochgelly Loch; Loch Leven, Kinross,

frequent. In this species both branches of the first pair of swimming feet are three-jointed, and of nearly equal length.

Attheyella cryptorum, Brady.

1868. *Canthocamptus cryptorum*, Brady, Jour. Microscop. Soc., vol. ix., pl. vi., figs. 1-10.
1880. *Attheyella cryptorum*, Brady, Mon. Brit. Entom., vol. ii., p. 60, pl. lii., figs. 1-18.

Habitat.—Duddingston Loch; in a ditch in the vicinity of Harelaw Dam, Balerno, near Edinburgh. Apparently rare.