

EDITORIAL ... *Adrian Chalkley*

Edition one of Cladocera News was nearly a year ago now. It has certainly been a busy year and our second edition has been rather delayed, but hopefully it is worth the wait. In the interim of course the revised species list has been released, this has been sent to and accepted by the Natural History Museum and the Biological Records Centre. A new Cladocera record card, RA32, has been compiled by the CEH and our species list has been incorporated into the new version of their Code List for Fresh Water Macroinvertebrates. (see Snippets for a download link)

The most important remaining aim of course is the establishment of a recording scheme. In order to set up an official scheme there is still some work to do and hopefully members will respond to the article outlining some possibilities later in this issue. As you will see we have already set up a three pronged approach for sending in records which should mean that everyone will find a method that suits them. Of course it is vital to ensure accuracy with difficult species so again we will need to find members to help with the verification process, also discussed later.

This year saw the 9th International Symposium on Cladocera in Verbania, Italy which Hannah attended, you can read her report later in this issue with more information to come on the website. We have also had some articles sent in by members to complete this issue, though unfortunately few on actual species records from around the country

The next issue can only happen if we receive more articles and progress towards a recording scheme will only occur when we get records sent in. So do please send in some copy, preferably by July 1st 2012 so that a summer edition will be possible. Good hunting to everyone for the 2012 season.

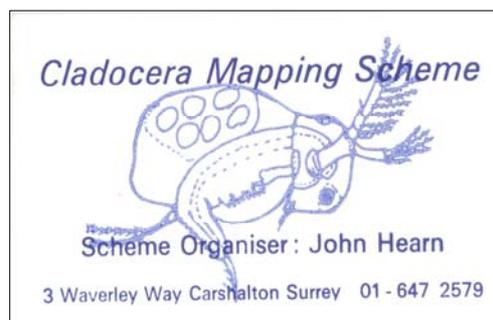
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Recollections of the original Cladocera recording scheme ... *John Bratton*

The first national recording scheme for Cladocera was run by John Hearn. He lived in Carshalton when I met him in 1981. I was at college in London and we were both taking part in the London Natural History Society's long-running survey of Bookham Common, Surrey. As a beginner to identifying invertebrates, I was surveying the triclads, leeches and Odonata, and would have tackled the Cladocera but John Hearn had already been doing so for some time (Hearn 1975, 1976). We met there several times, and I also visited him and his wife at their house. There he had a small printing press on

which he produced the Cladocera Mapping Scheme business card and personalised the BRC recording cards for regular contributors by filling in the recorder's name and code number.



He told me he had taken up the Cladocera when a training course he was undertaking required a research project. He was a school teacher, and it may have been part of his teacher training. It began as a survey of the Cladocera of a series of gravel pits before expanding into a national recording scheme under the umbrella of the Biological Records Centre. I'm told there were two people developing the scheme at first, but the

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other became more interested in breeding cats and John took the scheme on alone.

John Hearn visited me once when I was working in Epping Forest in 1985, and drove us out to Sawbridgeworth Marsh, an Essex Wildlife Trust reserve, where we found no standing water, no cladocerans, and got soaked by sudden rain. I also met up with him at Wicken Fen in 1987, where he convinced me that the *longispina*-group *Daphnia* in the ditches there was *D. rosea*.

In the 1980s I square-bashed for the recording scheme. BRC had promised a provisional atlas when the scheme had achieved a certain number of hectads with records, possibly 500 hectads. I guess the target was reached around 1985, because the record cards were called in by BRC to be computerised. However, there was a major mishap when a parcel of cards was lost in the post. They were on the way back to John Hearn for him to check the accuracy of the data inputting, so the data were not completely lost, but it meant the records on the BRC computer could not be validated without seeking out the original sources of the records all over again. The negotiations with the Post Office were lengthy and it was hoped that the cards would eventually be found, but they weren't. John's enthusiasm for the recording scheme seemed to fade around this time. By the late 1980s he was talking of taking early retirement from teaching and moving to Norfolk.

He eventually left the residue of the recording scheme at BRC.

My last contact with John Hearn was in 1989, before he moved from Carshalton. I estimate he was in his late 40s or early 50s by this time, so there is a good chance he is still around and perhaps could be coaxed into the Cladocera Interest Group.

In 2005, when working on a checklist of Welsh crustaceans as an employee of the Countryside Council for Wales, I asked BRC for a copy of any Welsh Cladocera records and received a computer file of about 850 records, so for the whole of Britain and Ireland there are probably a few thousand. Though they need validating, they would form a good foundation for a revitalised recording scheme.

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John H. Bratton

Cladocera Records Needed, Three Ways to Submit Them... *Adrian Chalkley*

If the Cladocera Interest Group is to move forward it is absolutely paramount that we start to collect species records. This should start now, prior to finalising a record scheme and submitting to the National Biodiversity Network in order to build up a modern picture of the British fauna and its distribution. With that in mind I hope that all members will try to send in some records this coming year. You can read more about finalising a recording scheme later on in this newsletter.

We already have three methods set up for members to submit records: an on line, web based system; you can email a list in spreadsheet format or use a postal based system using a new record card RA32 from the BRC.

The on line system is probably the best system to use for on going records if you are able to. Adding a few records at a time is quick and easy at the end of an identification session and you can log in whenever convenient to download all your records into a spreadsheet. It is also very convenient for a scheme organiser collecting records from all recorders in one go, on one spreadsheet. Also of course your own records are safely

backed up on a remote and separate computer. More about how this works later on in this issue.

During January Dr Roselle Hyman of the Biological Records

Centre has been compiling a new record card for Cladocera and I would like to thank her for her work in tailoring it to our requirements. Hopefully by the time you receive this newsletter it will be available for download as RA32 at:

http://www.brc.ac.uk/record_cards.asp

Records you may have made in the past will for most people either be stored on existing spreadsheets or on a database which can output

to a spreadsheet. Our website now has a blank spreadsheet to download which can be used to enter existing records or new ones. The arrangement of columns is very close to the way the on-line system outputs data and so is our preferred format. However I realise that existing spreadsheets will not necessarily be in this format and perhaps some data fields may be missing. I would encourage recorders therefore just to rearrange



Euryercus lamellatus Graham Matthews

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columns to follow our standard form if they can but if not then please send in data on your own spreadsheet in any case. It may take slightly longer to process this data but this is preferable to not having the records at all.

Several members have collaborated on the data fields for record collection. Whether you submit records via the on line 'Living Record' system, the downloadable spreadsheet or via the record card RA32 from the BRC, the data needed are the same. Note there are some optional fields which do not appear on RA32 but extra information can be added on the reverse of

the sheet if desired. Much more information on the fields will be found on the downloadable recording spreadsheet. Members were sent a copy of the spreadsheet with this newsletter and further copies are obtainable from the download section at:

<http://www.cladocera.org.uk>

Finally, whichever method you use to send in records it will be important to note the key(s) you used in identification. This will be a great help during the process of verifying & accepting records.

Where to Send in Your Records

You can access the on line recording system from our website:

<http://www.cladocera.org.uk/> or via the LivingRecord website:

<http://www.livingrecord.net/>

You will however need a user name and password to enter the site. To obtain these please email: records@cladocera.org.uk

Records sent in spreadsheet form, preferably on our downloadable spreadsheet, may be sent by post to:

Cladocera Records, c/o 37 Brook Hall Rd, Boxford, Sudbury, Suffolk. CO10 5HS

Records on the BRC card RA32 may be sent either to the address above or to the address on the BRC website:

http://www.brc.ac.uk/record_cards.asp

Cladocera Recording ... Verifying and Accepting Records

Whichever method of sending in records is chosen, before submitting these to the National Biodiversity Network at the Biological Records Centre some work will need to be done on verifying and accepting records.

Some species e.g. *Leptodora kindti* or *Polyphemus pediculus* are so unique they can be accepted without question. However we do not have the advantage that other recording schemes have of many years worth of records. Thus geographical or habitat based criteria for the acceptance of records are not at all as easy for us to use.

Because the present keys to the British Cladocera are so old mistakes are likely for some species. This is one reason for requesting that the key or keys used are noted down. Another reason is to help alert members when new keys or identification materials become available. Another potential source of problems is that accurate identification is often reliant on good microscope technique, often using both stereo and compound instruments.

Therefore when recording it is very useful to include notes on identification e.g. 'Antennule checked', '5 fine spinules on basal spine' etc.

However it is obvious that two things are needed to help the verification process.

1. It will be beneficial to agree which species we can accept records for without question and which species are tricky and will need confirmation by a referee.

2. We will need to ask for members with experience of some of the more difficult species to volunteer as referees.

- Therefore could any members who would be willing to volunteer as a referee please let us know.
- All members should feel free to suggest a group of reliable or easy species and another of problem species which present identification problems.
- This applies equally to those with more limited experience in identification, please let us know what you feel confident with.
- A list of the species you have never seen would also be very helpful, if we have some species nobody has ever found then we have no verification expert!

Please everyone send in your suggestions

Email any comments and contributions to:

adrian@cladocera.org.uk

Mapping Cladocera in the British Isles

Several members who tested out the Living Record scheme, asked if it was possible to have a distribution map available for the individual species records. That is impossible I'm afraid and is not what the system is designed for.

However in the future such a system will be desirable once enough modern records have been logged. As an interim measure it is hoped that we can adopt a similar system to that used by the BWARS website which displays a map direct from

the NBN website for each species in the list. This will of course mean setting up a recording scheme affiliated to the NBN.

To see how this works have a look at the website at:

http://www.bwars.com/maps_bees.htm

Let us hope we start getting enough records in to make such a mapping function a priority.

Living Record ~ On line recording for the Cladocera Interest Group

Living Record was started by Adrian Bicker for the Dorset Dragonfly Group, it has been written from scratch for the purpose of biological recording. Since our first newsletter Adrian has very generously volunteered to allow the Cladocera Interest Group space on his servers to enter and store our records. For this purpose Adrian has created a special user group for us, modified the data entry screens to record the parameters we require and added all the species in the revised British list.

To input records onto the system you will need to be given a user name and password and I would encourage all members to request these, please email records@cladocera.org.uk and one will be sent to you. Although you can go to the Living Record home page and register yourself you will automatically become part of the Cladocera group if you register via the Interest Group. The Living Record home page is at: <http://www.LivingRecord.net/>

The basic premise of Living Record is that once you log in you choose a vice county to enter records for and a satellite map will appear. Any sites where you have already recorded are marked. You enter a new site from a rough search by place name or by entering an OS Reference. Then you can drag the new marker to an exact location if needed. Having entered the site marker and site location information it remains on your map to add new records to at any time in the future.

The add new record screen is shown below:

The screenshot shows a web form titled "Add Record: Crustaceans: Water Fleas at Norton Suffolk". It contains several input fields and dropdown menus. At the top, there are "Genus" and "Species" dropdowns. Below that are fields for "Date and time", "Certainty" (set to "Sure=5"), "abundance", "partheno-genetic female %", "ephippial female %", "male %", "resting eggs % of sample", and "habitat". There are "Add" and "Cancel" buttons on the right. At the bottom, there are fields for "Note", "Recorder" (set to "me"), "Identifier" (set to "me"), and "Specimen".

When adding new records you will find a drop down list to choose the genus from and then a drop down list of the species in that genus - so no possibility of spelling errors. All species in the new British list are already entered.

There are help symbols next to most data entry boxes to assist you - just click on the blue question mark to get a help hint.

Most data entry boxes are self explanatory, you will find drop down lists to choose abundance and habitat. Living Record always requires you to enter a certainty level for your identification, which may be helpful during the verification process, although it is sometimes a difficult choice to make!

Life Stages - Parthenogenetic, Ephippial, Male, Resting Eggs

If you record the stage your Cladocera species has reached when examined then a + can be entered in these fields to show the presence of each stage.

Alternatively if you prefer, and more than one stage is present, then you can enter a number to show the percentage of each stage. (Make sure the numbers add up to 100 in this case)

If several species are recorded on the same date at the same site you may wish to record the percentage of each species. In this case, for each species, enter the percentage number in the column of the most common stage and a + in each other stage present. Make sure that the numbers in each species at the site on this date add up to 100.

Resting Eggs. If you have identified water fleas raised from resting eggs in a mud sample or a silt core from a lake bed put a + in this field.

A number in the Resting Eggs category indicates that you got more than one species from the resting eggs, check that the numbers in this category for each species raised from the sample on this date add up to 100.

Notice that 'Me' is inserted into both the Recorder and Identifier fields. This can be overtyped if needed but otherwise when your record is saved your name is inserted automatically as recorder and / or identifier (determiner).

You can extract your records to an Excel Spreadsheet at any time and choose a limited range of records or all your records to download.

There is of course a full instruction book available. It is worthwhile downloading this the first time you log on. Click on the Help button at the top of the screen.

One point should be noted however, Living Record is only designed to work with the Vice Counties of England, Scotland & Wales due to differences between the British & Irish mapping systems. For the time being therefore Irish records will have to be submitted on Spreadsheet or on RA32 record cards.

To obtain a user name and password to use the on line recording scheme please email your request to:

records@cladocera.org.uk

Photo Request

It goes without saying that the newsletter is much more interesting if we can include photos from members. So here is a plea to send in some more pictures for our next issue. You don't have to be an expert at photo-microscopy either, why not send in a photo of a favourite collecting site along with the species you collected.

If you have a novel collection method, an unusual net design or especially if you have designed some home made equipment, then a photo and description would be very helpful to other members. Whilst we are on the subject the other thing which would be extremely helpful would be any information on equipment suppliers you may have found.

Dates for the next issue can be found on the last page.

Dunhevedia crassa King (Chydoridae) in England ... John Bratton

Although *Dunhevedia crassa* has not appeared in a key to British Cladocera, it has appeared in a British checklist (Maitland 1977) and the distribution map on the National Biodiversity Network website shows three dots in England: two in East Anglia and one in the West Midlands. As I am partly responsible in a minor way, I thought I should summarise the evidence.

In 1987, while searching through the grey literature in the Nature Conservancy Council's library, I came across an ecological survey of the Breckland meres (Watson 1974). The survey covered 16 of the meres and lasted from October 1971 to 1973. The 46 species of Cladocera included several scarce chydorids. On page 7 it states "*Dunhevedia crassa* King, discovered for the first time in Britain during this survey, has been found at Ringmere, Langmere, Home Mere, Devil's Punchbowl and Mere A", though the table of results, Appendix 1A, shows *D. crassa* at only the first three sites. Elsewhere (p. 39) it states *Dunhevedia crassa* has been discovered in almost all of the semipermanent meres; in table 4 *D. crassa* is listed as part of the peri-fauna of *Polygonum amphibium* in Ringmere on 11 September 1972; and table 6 shows four *D. crassa* ephippia per 100 square centimetres were found in a sediment sample from Langmere in January 1973. The grid references for the meres mentioned are: Home Mere TL893896, Langmere TL905885, Ringmere TL909879, Devil's Punchbowl TL878891 and Mere A TL854908.

I enquired at NCC's Norwich office about the survey procedures, and in February 1988 P.A. Wright, NCC's Senior Assistant Regional Officer, replied as follows. "Raymond Watson works at Anglian Water here in Norwich so I was able to quiz him direct. On his meres project for us, Dr Fryer of FBA checked a lot of material, also Dr Kennedy of Exeter University. Specimens are retained for several groups and are available for inspection. Raymond's M.Phil. thesis contains drawings of material and references to identification of taxa." At that time I didn't attempt to follow up the records any further and they were accepted by John Hearn for the Cladocera Mapping Scheme. I also added the ones from Home Mere, Langmere and Ringmere to NCC's Invertebrate Site Register, from where they eventually became part of Natural England's contribution to the NBN. Prof. Fryer has told me (30 May 2011) he was the external examiner for Raymond Watson's M.Phil. and though he can't remember whether he actually saw a specimen of *D. crassa*, he was satisfied by the records and so probably did. He suggested specimens could have been deposited at the Natural History Museum in London, but they were not (Prof. G.A. Boxshall, pers. comm.).

R. Watson's 1976 thesis is in the library at the University of East Anglia, and it would be useful to find what figures and extra information it contains. It is likely that he did further survey work after completion of the 1974 report.

In 1988 or 89, John Hearn told me he had found an old published record of *D. crassa* from the Birmingham area. I didn't get any more details at the time. Several years later I was given a copy of A.G. Lowndes' 1931 paper on Entomostraca of the Birmingham district. I may be doing John an injustice, but I have long suspected he had misinterpreted a record in that paper of the harpacticoid copepod *Attheyella crassa*, which appears in a mixed list of copepods, cladocerans and ostracods from Longmoor Pool, Sutton Park (SP094958).

However, the West Midlands record in the NBN is from SO87, supplied by Worcestershire Biological Records Centre, so in March 2011 I asked for further details. The manager of the record centre Simon Wood replied as follows. "The record for *Dunhevedia crassa* was at Hartlebury Common (SO824707) in 1935. There is no actual named individual but it looks like the record was extracted from a publication of the Birmingham Natural History Society. I'm afraid this is all we have. The original record card was computerised correctly so if there is an error it will be from the original transcription to card or in the identification itself."

When entering biological records into a computer database, it is common to click on the desired name in a list, or type only an abbreviated version of the name, and it is easy to make an error and enter the wrong species. But this record was copied by hand onto a card, so a transcription error would be unlikely to produce the name of a non-British cladoceran.

I contacted the Birmingham Natural History Society to ask if they could suggest a published source of the record, and their editor David Antrobus replied "I have looked through the Proceedings of the Birmingham Natural History Society from 1930 to 2010. There are a number of articles on Hartlebury Common, but none of them mention water fleas nor *Dunhevedia crassa*. I cannot think what other publication it could be in."

Cladocera records in the national Biological Records Centre at Wallingford include the Hartlebury Common record, but with no more detail than is held by Worcestershire BRC (C. Harrower & S. Ames, pers. comm.).

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Despite the record not being in his Birmingham paper, A.G. Lowndes is still a possible source for the Hartlebury Common record as he was a very active recorder based at Marlborough College, Wiltshire, though as one of the major authorities on microcrustacea in Britain at that time, one would expect him to have passed on the news of a new British species to D.J. Scourfield. I enquired whether the college's natural history society holds any of his notebooks, but Dr T.E. Rogers, Honorary Archivist of Marlborough College, told me that when A.G. Lowndes left Marlborough in 1938 it appears that he took all his personal notebooks with him. Dr Rogers also searched through

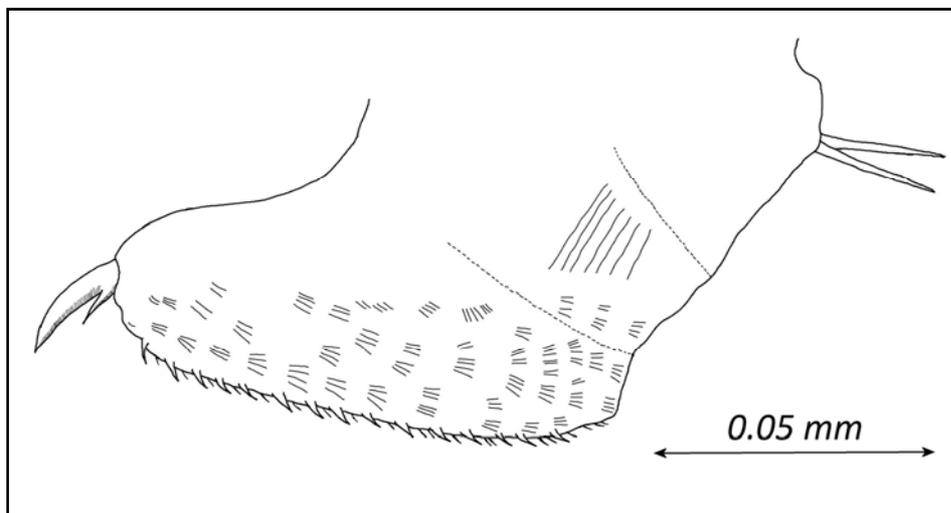


Fig 1. Postabdomen of *Dunhevedia crassa* female, redrawn AC based on Flössner (1972).

the Reports of the Marlborough College Natural History Society for the period 1930-38, but found no references to any records of species outside the Marlborough area.

In summary, at least three of the East Anglian records are reliable and examination of R. Watson's thesis may add more records; but the West Midlands record requires further explanation. A new survey of cladocerans on Hartlebury Common could provide corroboration, though failure to find *D. crassa* there would not disprove the earlier record - the habitats present and the size of the Common are likely to have changed drastically in the last 75 years, and from aerial photographs it now looks very arid. Have we any readers in the Birmingham area? It is perhaps surprising that *D. crassa* is not more frequently recorded from Britain, as it has a very wide distribution: Australia, Tasmania, Egypt, Algeria, Bolivia, Brazil, and various forms described from Europe (Smirnov 1996).

I am very grateful to P.A. Wright, Prof. G. Fryer, Prof. G.A. Boxshall, S. Wood, D. Antrobus, C. Harrower, S. Ames and Dr T.E. Rogers for assistance with my investigation.

Identification

There are detailed illustrations of *Dunhevedia crassa* in Flössner (1972), Margaritora (1985) and Smirnov (1996), and a thumb-nail sketch in the key of Amoros (1984). Judging by these illustrations, it would key out to an *Alona* or *Alonella* in Scourfield & Harding (1966), or possibly to a *Chydorus* if one chose the "Body globular" route at couplet 61. *D. crassa* bears a distinct tooth at the postero-ventral corner of the valve which distinguishes it from *Chydorus* and *Alona* spp. (*Alona protzi* has three teeth in this position). Amoros (1984) also uses this tooth to distinguish *Dunhevedia* from *Alonella*, but Flössner (1972) and Margaritora (1985) show such a tooth is present in *A. nana* and *A. exigua*. At 0.4 - 0.6 mm long (females), *D. crassa* is clearly larger than *A. nana* but overlaps in size with *A. exigua*. The postabdomen of *D. crassa* is also highly characteristic: it is short, broad and blunt-ended, with about 15 teeth along the

distal dorsal edge and short hairs proximally; and with numerous small 'combs' of short hairs scattered along the sides of the postabdomen and pointing towards its base (fig. 1).

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The following article from Phillip Greaves was originally much longer and only a shortened version would fit here. The full article is available on the www.cladocera.org.uk website. (Editor)

Photomicrography, the process of taking photographs with the microscope – used to be a highly specialised skill taking many years of practice to achieve good results. Digital cameras have largely changed that as the instant viewing of results allows errors to be corrected immediately.



This introduction aims to help those with limited skills or confidence to get started in photomicrography, which can now be performed at relatively low cost and with minimal equipment.

Good microscope technique is the essential starting point to taking good photomicrographs. Most 'water-flea' photographers will want to use a 'high power' or compound microscope to achieve the right level of magnification; few 'cladoceran' crustaceans are large enough to need the wide field of view of a stereomicroscope for photography. With the compound microscope, the aims in setting up the microscope are to achieve even illumination and an acceptable level of contrast with the subject; the human eye can correct for a lot of defects automatically which the digital camera faithfully records!

Achieving Even Illumination

Modern microscopes with built-in illumination make achieving even illumination much easier than the old mirror and separate lamp arrangements. The procedure for setting Köhler Illumination, the standard method for achieving even illumination, is described in most microscope manuals. Simply focus on the specimen with both the substage condenser and the field lens (the one closest to the lamp) iris open. Partially close the field iris and focus the condenser down from its top position until the edges of the field iris are sharply focused in the same field as the specimen. Now open the field iris until its perimeter is just outside the field of view. Now remove one eyepiece and, looking down the eyetube, partially close the condenser iris until it blocks approximately one quarter to one third of the field of view. This is the optimum setting for contrast in brightfield conditions. Note that some simpler (but still perfectly capable) microscopes do not have a field iris; in this situation a ground glass filter is usually present close to the bulb to diffuse the illumination.

Achieving Contrast

This subject alone fills several books and cannot be covered to any extent in this introduction. However, achieving good contrast with cladocerans is important to produce good results. Brightfield conditions can work well, especially if the specimen

has been 'cleared' for several hours in a suitable fluid (e.g. dilute glycerine, chloral hydrate solution or weak lactophenol mountant).

Darkground and Rheinberg illumination also work well and produce attractive results. Darkground (figure 1) is achieved either by use of a special darkground condenser (usually a cardioid mirror) or (for objectives up to x40) with a patch stop in the condenser filter tray. If you have a phase contrast condenser, the phase ring for a higher magnification objective often works well as a darkground stop. Rheinberg Illumination (figure 2) can produce beautifully coloured images, with the background one colour and the waterflea in a contrasting colour. It is achieved using a filter with an inner circle of one colour (forming the background) and an outer ring of the complementary colour.



More information on Darkground and Rheinberg and how to make the discs for condensers can be found at <http://www.microscopy-uk.org.uk/mag/indexmag.html?http://www.microscopy-uk.org.uk/mag/artapr02/contrast.html> or search Google under 'Easy to Make Contrast Enhancement Filters for the Microscope'.

Finally, for the well-funded, Differential Interference Contrast (also known as DIC or Nomarski after its inventor) provides superb contrast – but at a price!

Choice of Camera

Often the choice is already determined by what is already available! The easiest route is certainly a camera with a removable lens – typically a DSLR camera. More recent models have tilting viewing screens which can help with framing and focusing (rather than climbing a ladder to see down a camera mounted on top of a tall microscope!) but the best solution if the camera is capable, is to use 'tethered' shooting, driving the camera and viewing the image directly from a computer via a USB lead. Canon cameras in particular are very easy to use in this respect.



Fig 3

Cameras with fixed lenses can be used but require more thought in how to couple the camera to the microscope. Some have a filter screwthread at the front of the lens which can be coupled to an eyepiece with the same screwthread (figure 3) or the lens can simply be held in place over the eyepiece with a home-made support bracket.

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Coupling Camera to Microscope

Both the microscope and camera need suitable fittings for the two to be coupled together.

With compound microscopes, the easiest option is to use a trinocular tube (providing binocular tubes for viewing and a third vertical tube for permanent attachment of the camera). Trinocular tubes contain a prism that diverts either all or some of the light to the camera; more advanced fittings have a slider that allows different division of the light to either the eyes or camera. A much lower cost solution, fine for occasional photography, is a simple vertical monocular tube that replaces the normal angled viewing head. Finally, it is possible to couple a camera directly onto one of the angled eyepiece tubes of a binocular head as a temporary set-up; heavier cameras make this more difficult and a stable (heavy) microscope is required.



Fig 4

With stereomicroscopes, the situation can be more difficult. Stereos can be supplied or fitted with trinocular heads but these are expensive and hard to find secondhand, whilst the eyepiece tubes are generally of wider diameter (e.g. 30mm) and do not fit the widely available microscope to camera adapters.

The camera will need a microscope adapter to connect to the microscope tube. These are readily available secondhand (either from the adverts in *Amateur Photographer* or via E-Bay); it is best to find one with a T-2 thread mount (such as the Pentax adapter; figure 4) which can then be mounted onto the camera bayonet mount with a readily available T-2 adapter (again via E-Bay). New versions can also be bought from SRB-Griturn (<http://www.Srbfilm.co.uk>).

The final consideration is the eyepiece to be used between the microscope and camera. A normal viewing eyepiece can be used but will require the microscope to be significantly defocused to achieve focus at the camera. This can often be reduced or eliminated by slightly raising the eyepiece in its tube by about 5 mm with a card or paper collar; some experimentation will be needed to find the most amenable eyepiece and its best position. If available, choose a lower power eyepiece to achieve a wider field of view on the camera. Specialist photographic eyepieces, usually of low power, are also available; the Olympus versions work well in most circumstances and are often available secondhand.

Taking the Photograph

Stationary subjects are much easier to cope with! Water fleas can be killed easily or narcotised with Boots brand Anaesthetic Throat Spray (containing Lidocaine).

The camera, with lens removed, should be set to Shutter Speed control (or fully manual) and typically set around 1/15 of a second to start with. Film speed (if selectable) should be set to a low ASA e.g. 100 or 200 and white balance to automatic. The big issue in taking a photomicrograph is preventing

vibration from the camera mirror, which is magnified by the microscope and results in 'blurry' images. Many DSLRs have a 'mirror lock' option in their menus, or the mirror will already be 'up' if shooting from 'Live View' mode (which makes framing and focus much easier). Even now, the process of touching the shutter button will cause vibration and must be avoided. The options are either to use an electronic shutter release cable, or to use camera software to 'fire' the camera from a computer.

Reviewing the Results; Correcting Defects

The great magic of digital photography is that results can be viewed immediately and defects corrected. Common problems:

1. Dirt in the field of view (figure 5) – the usual locations for dirt are the top lens of the condenser and the top of the eyepiece. Condenser dirt can be detected (and eliminated from the photo) by slightly defocusing (lowering) the condenser. In both instances clean with a blower brush and lens cleaning solution.



Fig 5



Fig 6

2. (Uneven illumination (figure 6) - Problems here can be difficult to detect as there are several possible causes. Check firstly that the microscope is set up correctly and that the condenser filter tray has not been pushed partially across the illumination path. Other problems may be caused by a non-aligned component of the microscope (such as the condenser). The eyepiece

used to project the image to the camera may also be a cause of 'flare' – trial and error with different eyepieces may be needed.

3. 'Grainy' appearance (figure 7) – Results from having the condenser iris closed down excessively. Open it to no more than one third of the aperture of the objective when looking down an eyetube with the eyepiece removed.

Like most skills, perfection comes with practice, and at least with digital cameras trial and error costs nothing.

Phil Greaves



Fig 7

I'm sure that all members of our group would agree that for the Interest Group to make a real difference we need to not only record but to share those records and distribution data. We have three methods for you to send in your records and for now I will undertake to store them all safely and keep backups. This is not to say however that I am necessarily putting myself forward as a National Recorder, there is a need for a central repository and I will happily fulfil the role for now. So whilst I am not expecting a deluge of replies the offer goes out to all members :-

Do you want to take on the role of co-ordinator of a National Recording Scheme for Cladocera?

For myself I would be happy to co-ordinate the interest group with Hannah and edit the newsletter. However, if we do not re-establish a scheme and start to submit to the NBN then we will start to drift so if there are no other volunteers I will begin the process. (But if it takes time for a volunteer to appear I can always relinquish the role later this year!)

What still needs to be done to set up the scheme?

Many things are either already done or are in progress but, working from information on the NBN website the following are the most important things to do:

- To register with the NBN
 1. Complete & submit the necessary metadata forms, data provider agreement etc.
 2. Register a dataset administrator
 3. Register the group as an organization on the NBN this allows NBN users to register as our members.

- Develop a data access policy & publish on website.
- Develop a privacy policy & publish on the website.
- Decide on sensitive data. Are there any? What are they? Why are they sensitive?
- Data dissemination to be through NBN including using their maps on our website
- Sort out standard data use agreements - send to recorders & publish on website

In addition the following may or may not be required in time:

- Produce a recording pack with guidance for new recorders.
- Produce covering letters / cards for recorders seeking permission to survey.
- Consider training for potential recorders.
- Set up a programme to produce an atlas - at which point we will need to consider financial resources.

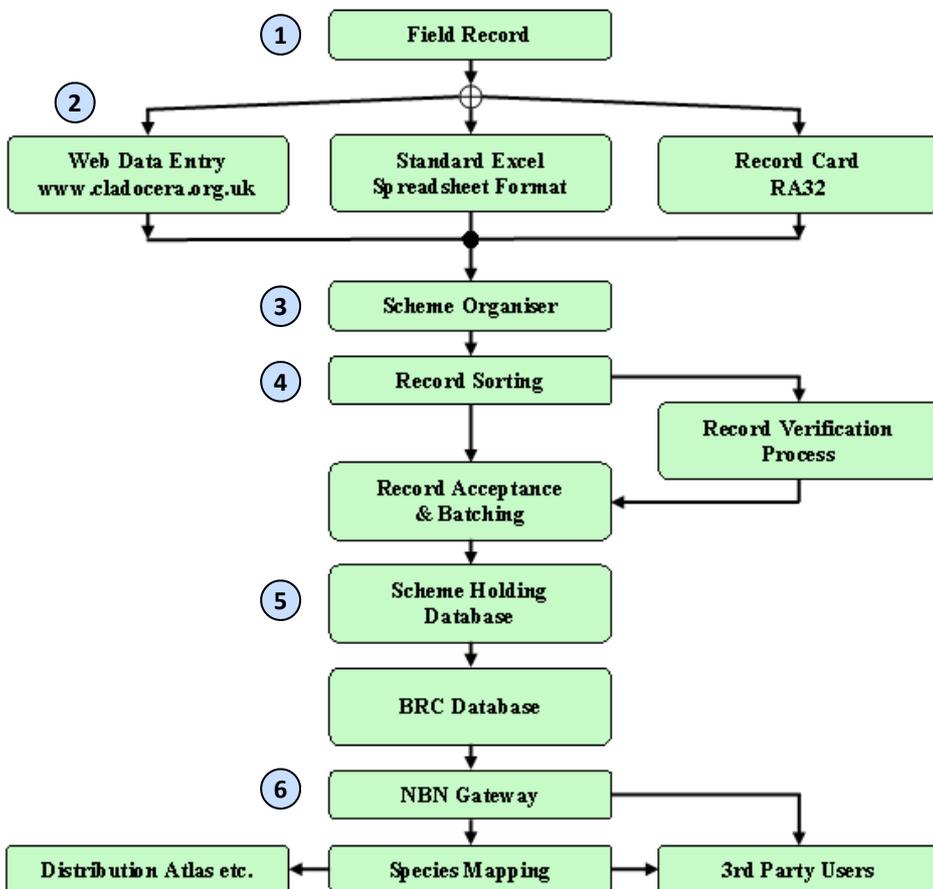
I have already spoken to the Information Commissioners Office and it seems we would be exempt from registering with the ICO although of course must still comply with the Data Protection Act 1998

How will the recording scheme work in practice?

As far as I can see the flow chart below would sum up the process.

Comments welcome

I would certainly appreciate any comments. Have I left anything out, are there any issues you think need addressing? And of course if you wish to volunteer any help; dataset admin, verification of records, design recorder guidance etc. etc. then please, please let me know.



1 Members record species as they do at present and maintain their own records.

2 Whenever convenient to them these records are entered onto the website, or sent as a spreadsheet or RA32

3 Records are uploaded or sent to the Scheme organiser or administrator.

4 The administrator sorts out any records that need to be sent to someone to verify, the recorder is contacted with the verifiers name. The verifier checks and accepts or rejects the record, sending this information to the administrator.

5 Once records are accepted they are batched and entered onto the scheme spreadsheet, this is periodically sent to the BRC database once it has been processed through the NBN record cleaner software.

6 Once checked at the BRC it is queued for entry onto the Gateway. Entry allows 3rd party users access and our website to display updated distribution maps.

The pond net has to be one of the simplest of scientific tools yet the type of net used will have a major influence on what is caught. This article gives an overview of the main types of net, provides supplier details and some guidance on net care.

Net Types

Nets can be divided into two main types – hand (or pond) nets used on the end of a pole used in a sweeping motion from a bank or jetty, and trawl (or plankton) nets designed to be dragged through the water on a rope.

Hand nets are usually small, supported on a metal frame of 150 to 250 mm opening with a square or conical net less than 300 mm long and handle up to 2.5m long; beyond this length is unwieldy.

Older hand nets were of round frame and supported a net made from bolting silk (used in silkscreen printing). More modern nets usually have a square frame making sampling along a flat surface (jetty wall or lake bottom) much easier and nets are now constructed of nylon with defined mesh size. The size of net mesh will influence what is caught; generally for cladocera a mesh of 50 μm is recommended to retain the smaller species (e.g. Chydorus). Larger meshes (or holes in the net) will result in these smaller species being missed. Smaller meshes are also available (for nanoplankton) but tend to clog more easily. At the end of the net either a sample tube is screwed in to retain the catch, or a nylon filter that allow water to pass through (easing the 'sweep'); my personal preference is for a tube (e.g. 30ml Universal container) which can then be emptied into a larger bottle. End filter arrangements tend to cause more damage to water fleas and require the filter surface to be washed into a tray or bottle after collection.

Hand nets obviously have very limited reach and to sample open water species in larger ponds or lakes a trawl net is necessary. These usually have a circular frame of 250 – 300 mm opening, a net of up to 1 m length terminating in either a tube or filter, and a drawline of about 10 m. Trawl nets can either be towed through the water from a boat (a canoe works well) or thrown into the water from a bank (some practice is necessary to achieve a good throw!). Again, a mesh of approximately 50 μm is recommended for freshwater species but for marine cladocera a slightly wider mesh (e.g. 150 - 250 μm) is preferable to prevent the mesh clogging too quickly.



The Hand Net

For micro-habitats such as puddles, tree boles or bromeliads no net is necessary; I find that a plastic turkey-baster works well!

Suppliers

Nets can be home made and several designs have been published providing instruction on how to cut a conical net. However, commercial nets are readily available at reasonable price. In the UK, EFE-GB (<http://www.Efe-uk.com>) is the main supplier with a wide range of nets, frames and handles; Watkins and Doncaster (<http://www.watdon.co.uk>) also provide simpler, traditional style nets. The EFE-GB nets are robust and will last many years. My own (personal) reservation is that the standard net frames (250 mm) are larger than necessary and very restrictive in small ditches and puddles, and the solid wood handles are much heavier than necessary. My own net was made as a special, using EFE's children net frame (150 mm opening) with 53 μm mesh net. I replaced the wood handle with three locking sections of net handle from Watkins and Doncaster (actually metal tent poles) and have replaced the net end filter with a 30ml bottle.



The Trawl Net

In the US (and available by mail order, most of the biological supply houses such as Carolina Biological Supplies and Turtox) supply nets (although shipping costs outside of the US may be more high).

Net Care

Modern nylon nets are much less prone to rotting than the traditional bolting silk but still should be thoroughly washed in running water and dried completely after use. The risk of transfer of species from one area to another must be prevented, and especially the risk in the UK of facilitating the spread of the invasive *Dikerogammarus villosus*, recently found in Cambridgeshire and South Wales (check the Environment Agency website for details of the Check Clean Dry campaign) by thorough washing and drying. Importantly if using nets and other equipment overseas, equipment should be sterilized both before going and immediately upon return to prevent the transfer of exotic species. I seal my nets in a poly bag containing kitchen paper soaked in formalin (carcinogen – care!) for a few days to expose the nets to formaldehyde vapour; for those unable (or unwilling) to use formalin, Hydrogen peroxide solution can be tried. Well-cared for, a net will last a lifetime of sampling.

Updated British Species List

The updated British Species List for Cladocera was sent out to members last year. The new RA32 record card has now been finalised and so all species on our list now have updated species codes which will be used by the BRC.

The species list, now updated with the new BRC species codes, will be available for download from our website and a copy is included with the blank record sheet sent out to members with this newsletter.

Towards a New Cladocera Key A Way Forward ? ... Adrian Chalkley

In our first newsletter we stated that we had heard that a new FBA key was in preparation. This was in fact true, up to a point. Having been in contact with the proposed authors it appears that, in their own words, substantial progress had been made with the text of a Cladocera key. However this was some time ago and the project ground to a halt for a variety of understandable reasons one of which was the provision of suitable illustrations.

The FBA have confirmed that they are still very keen to publish a revised key but short of starting afresh with a new volunteer author things do seem to remain stalled.

However a new approach has been suggested, namely that the FBA be approached with the idea of using what has been achieved so far as a basis for a new key. This base text would then appear on a website to be added to by members who would try out the key. They would submit illustrations and modifications to the text to improve the readability or reliability and so gradually a new key could be formed. This type of approach could possibly be hosted on the cladocera website or on the FBA site but would need input from IT experts, again possibly from the FBA.

A final key could well be published in the normal way or could end up as an online key. This might take the form of a sequence of web pages each split into two with each half

representing a couplet choice. Comparing your specimen with the illustrations and text would lead to clicking on one choice, taking you to the next webpage as the next couplet in the key. For examples of this approach try the web links at the end of this article. The advantage of this approach is that it can easily be updated by adding better photos or with text changes. It is even possible to add new species relatively quickly instead of needing to print a whole new edition. Of course there are many advantages to having a 'proper' printed key beside the microscope and not everybody has good enough broadband access to use web based keys.

All of this is very much merely an idea, it is included here for criticism and modification by readers. So what do you think? Could you contribute drawings, photos or text; could you try out and modify text? Please let us know your thoughts. Whilst a new key is very important this approach will need a large effort from many members of the Cladocera Interest Group to come to fruition.

To see how web based keys work try these links:

Freshwater Oligochaete key:

<http://apps.biodiversityireland.ie/OligochaeteldKey/key.php>

Freshwater Mollusc key:

http://www.conchsoc.org/aids_to_id/fwidbase.php

IXth International Symposium on Cladocera, 2nd-8th October 2011 ... Hannah Robson

In October I attended the IXth International Symposium on Cladocera, held in Verbania, Italy. The conference was held at a beautiful hotel in the centre of Verbania, a town on the shores of the beautiful lake Maggoire.

The programme of presentations covered a vast range of topics over four and a half days (with a midweek excursion and dinner!) delivered by speakers from across the globe. There were also posters, which were advertised in 3 minute talks in the main auditorium before 2 afternoon poster sessions. Adrian and I put together a poster for the Cladocera group, to advertise the group and try to hopefully expand our range of members.

Cladocera Interest Group Presentation



The talks and posters covered invasive species, paleolimnology, resurrection ecology, life histories, spatial distribution, phylogeography / population genetics, host parasite interactions, taxonomy, physiology, stress, dispersal and the effects of food quality, predation and stressors. For more information on individual talks see the Abstract book and a selection of posters which will be on our website soon.



Arrival in Verbania

It was fascinating for me to hear about all the work going on around the world with Cladocera, the experience really emphasised the lack of work going on in UK, of the 150ish participants, I was the only person from the UK! (and I'm not even a full time Cladocera worker!). It was also great for me to meet face to face with some of our current members in the poster session and to be introduced to some very prominent and experienced researchers (my thanks to Kay Van Damme for the introductions!)

(email : kay.vandamme@gmail.com; j-f.cart@wanadoo.fr)

Exotics are considered to have an impact on indigenous populations, ranking high among the human-mediated threats to nature. This is well known and extensive literature is available on the subject. On islands, exotics are considered often as the main cause of the decline of native species. Not all exotic species are, however, directly introduced by humans, but could expand their distribution in correlation with climate change. Species may gradually move and suddenly appear in unexpected regions outside of their distribution ranges for a short period of time and disappear again. Alternatively, these species may establish thriving populations and are able to expand. Not all exotics become invasive, depending on a large number of reasons, among which climatic factors as well as direct competition with the native species that occupy the same or similar niches. Among the zooplankton, such exotics may also occur, and although the effects may be very subtle at first, if dominant, their presence may well cause shifts that change complete ecosystems. This is all known.

Once the indigenous fauna of a region is well known, it is possible to keep an eye out for non-indigenous species, of which records are very important and allow an idea of the species' arrival and expansion. A firm base-line is now the case for the cladocerans of the UK and it is most useful to know the indigenous fauna in order to be extra attentive for exotic species of which records occur elsewhere in Europe.

This short note aims to increase the awareness and the attention needed in recognizing exotic species among the Cladocera for future follow-up. One species is briefly discussed in this short communication, in the hope that it will initiate a wider attention of readers to this recently expanding chydorid in Europe.

Disparalona hamata (Birge, 1879)*
Pleuroxus hamatus Birge, 1879 (Pl. II, figs 13-14)
 non *Pleuroxus hamatus* (Baird, 1834) = *Lynceus hamatus*
 Baird, 1834

(*sensu Smirnov (1996) and FADA Cladocera Checklist of the World. Whether this species belongs to *Disparalona* or *Alonella*, and whether the epithet should be *hamata* or *hamulata*, should be part of a morphological revision, accompanied with a nomenclatural discussion. Closer in morphology to *Alonella* than to *Disparalona*, the assignment to either genus requires closer study and is not done here!)

First described by Birge (1879) from Southampton, Massachusetts (USA), this species is known from North and South America, Africa and Southern Asia (Smirnov, 1996). Predominantly a species from tropical and subtropical regions, Birge (1879) stated with the original description that this

species is "not rare" in the US. It is therefore not restricted to warm regions only (and quite likely, more than one cryptic species are understood under this name). Although close by (e.g., in northern Africa; Smirnov, 1996), Europe is considered not part of its natural distribution range. However, the species does occur here.

Šrámek-Hušek (1946) recorded *D. hamata* from the Czech Republic in Prague (Illyová & Hudec, 2004), from the Vltava River (Moldau) and connecting channel, likely introduced (Floessner, 2000). Illyová & Hudec (2004) found this species in 2003 in a single locality the Danube basin on Slovak territory. Louette et al. (2007) mention *D. hamata* (as *Alonella hamulata*) for the first time from two localities in Belgium in 2003 and 2004, and note that it is possibly introduced with fish and likely to expand northward in the future. In France, J.-F. Cart (unpubl. data, 2010) has found this species in several occasions in recent years and in large populations. We do not know where it comes from – not enough has been done on the fine morphology of this complex (*D. hamata*-complex), which would help tracing its origin. The European populations could be just as well be from African, Asian or American origin, and it is even likely that these three continents harbour different species (*chappuisi* is an available species name for the African populations). Considering that the species was never recorded before Šrámek-Hušek (1946) and only again in 2003 and the fact that it has no specific ecology (which would limit the understanding of its distribution), it is quite certain that this is an exotic species for Europe.

A. Chalkey (Boxvalley AquaSurveys) informed us that Dr Roselle Hyman (Centre for Ecology & Hydrology, UK) has found two records under *Pleuroxus hamatus* from the UK, from Yetholm, dated 1840. Hence this short communication. The records were made by the British freshwater biologist Dr W. Baird. Do these records indeed belong to *D. hamata*, or not? If so, should the name be added to the updated list of Cladocera species in the UK? Considering this species' occurrence on the continent, it is possible that *D. hamata* does occur in the UK, but we should be careful with all species names in the older records. The question comes down to this: did Baird, at the time of the recording in 1840, mean the same species as Birge did later? In fact, he didn't.

Let's take a closer look. Baird (1843) wrote in his "*Natural History of the British Entomostraca*" under the entry *Pleuroxus hamatus* (Baird, 1834), syn. *Lynceus hamatus* Baird, 1834: "*I first found this species in the autumn of 1835 in Yetholm Loch, Roxburghshire, and afterwards in a pool near Yetholm Bridge, and have since not met with it.*" The records are therefore clearly from the same locality (Yetholm, UK) and can be confirmed as being made by the late Dr W. Baird.



Pleuroxus hamatus (Baird, 1834) as depicted in Baird (1843) is a real *Pleuroxus*, not an *Alonella* or *Disparalona* and a different species from that described by Birge (1879) under the same name. After Baird

Yet the species' name is confusing. Baird had already used "Pleuroxus hamatus" in 1843, indicating a species from the UK, long before Birge (1879) had used the same name for his new species from the US. When Birge (1910) noticed the name was not available, already used by Baird (1843), he proposed *Pleuroxus hamulatus* Birge, 1910 instead. So, *Pleuroxus hamatus* (Baird, 1834) and *Pleuroxus hamatus* Birge, 1879 (later, *P. hamulatus* Birge, 1910) are not the same species.

Baird's species, *P. hamatus* (Baird, 1834), is a junior synonym of *P. aduncus* (Jurine, 1820) (Smirnov, 1971) or of *P. trigonellus* (e.g., Floessner, 2000). Birge's species, *P. hamatus* Birge, 1879, is the species that we now understand as *Disparalona hamata* (Birge, 1879) or *Alonella hamulata* (Birge, 1910). It is not uncommon in the study of the history of chydorid names to be confronted with such a confusion (look at the type species of *Alona*; Van Damme & Dumont, 2008).

Therefore Baird's records from Yetholm do not belong to *Disparalona hamata* (Birge, 1879) as understood in Smirnov (1996) and most likely belong to a *Pleuroxus* species. Therefore, the name should not be included in the British Checklist. However, it is important to keep an eye out for this exotic *Disparalona* or *Alonella*, as it could appear in the UK anytime. And not only in the UK, but elsewhere in Europe as well. The records from Czech Republic, Slovakia, Belgium and France indicate that this species is present in the region and likely expanding. If so, it is important to have a baseline and monitor its presence, the first step in following up any exotic species.

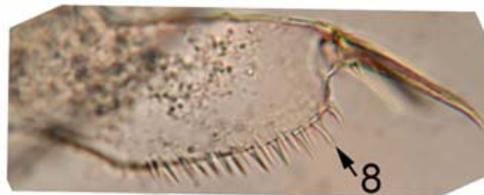
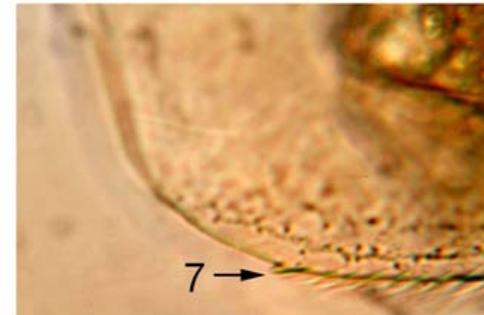
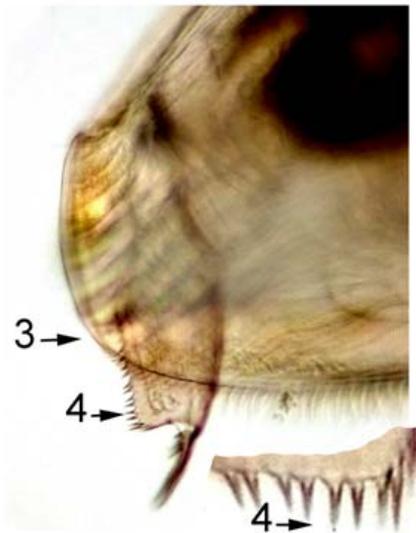
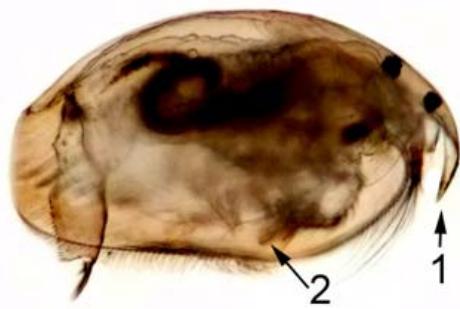
Recognizing *Disparalona hamata* (Birge, 1879)

How to recognize *Disparalona hamata* (Birge, 1879) (or *Alonella hamulata*) easily? There are really not many species in the genera *Disparalona* and *Alonella*, so it is quite straightforward – I refer to the keys in Smirnov (1996), which shows six species for *Disparalona*. Good drawings of both *D. rostrata* and *D. hamata* can be found in Floessner (2000) (latter under *Alonella hamulata*). In Europe, we expect *Disparalona rostrata* (Koch, 1841) as the most common species and we often ignore to look into more detail, as we do not expect a second species – but we should. In fact, also the North

American *Disparalona leei* (Chien, 1970) (see Michael & Frey, 1984 for the differences in morphology) seems present in France, but this needs closer investigation (J.-F. Cart, unpubl. data). Closer attention to the morphology of these species will give us a better idea about the distribution of the exotic *Chydoridae* in Europe.

A few pictures are included below to facilitate the recognition of *Disparalona hamata* (Birge, 1879) or *Alonella hamulata* (Birge, 1910) compared to the most common European species, *D. rostrata* (Koch, 1841), illustrating specimens from a same locality in France. As it is possible that more *Disparalona* species are present (*D. leei*), one should check all *Disparalona* specimens lacking a posteroventral denticle on the valve, more closely.

1. *D. rostrata* often has a denticle in the posteroventral corner, whereas *D. hamata* does not. The headshields completely differ – in *D. rostrata*, the rostrum is not as long and narrow/sharp as in *D. hamata*. When the habitus is seen, in *D. rostrata*, the tip of the rostrum points downwards, but in *D. hamata* the tip is longer and curved inwards, so it does not point downwards but more posteriorly. The posterior margin of the headshield is broad convex and wavy in *D. rostrata*, but triangular (narrowing to a point) and not wavy in *D. hamata*. In *D. leei*, the posteroventral corner of the valves always lack a denticle while *D. rostrata* rarely lacks it (see Michael & Frey, 1984)
2. *D. hamata* has an unusually large hook on the inner distal lobe (IDL) of the first limb. This character can be easily seen through the valve without dissection, as the hook is conspicuously large in *hamata* females. In other *Disparalona* species, there is a normal seta here. Limbs are not used in identification of cladocerans except a few specialists, yet this character is very conspicuous here, the heavy chitinized hook in the females of this species being nearly as big as the typical copulatory hooks of the males. A large hook in females here is also unusual in *Alonella*.
3. Distal marginal teeth (the three to four distalmost teeth) on the postabdomen are distinctly larger than the other marginal teeth in *D. hamata*. In *D. rostrata* (as well as in *D. leei*), the marginal teeth gradually increase in size and consist of singular teeth. The shape of the postabdomen is also completely different in *D. hamata* (as Illyova & Hudec, 2004 note) from all other species in the genus and reminds more of *Alonella* species (e.g., *A. clathratula*).



Disparalona hamata
Alonella hamulata

Disparalona rostrata

Left: Not in the UK yet, but vigilance is required... the exotic *Disparalona hamata* or *Alonella hamulata*, collected from the River Seine, France, 2004, by JF Cart. Characters: 1. Rostrum curved inwards and acute, 2. Large chitinized hook on first limb, visible through the carapace, 3. no denticle on posteroventral corner of valves, 4. Larger distal marginal teeth on postabdomen.

Right: *Disparalona rostrata*, collected from the River Seine, France, 2009, by JF Cart. Characters: 5. Rostrum pointed downwards, not posteriorly. 6. No big hook on P1, 7. Denticle on posteroventral corner of valves, 8. Distal marginal teeth on the postabdomen not distinctly larger than other teeth. Photos by JF Cart, no scale bar included and specimens adapted to show in the same

Acknowledgement

With thanks to Adrian Chalkey and Dr Roselle Hyman.

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- Van Damme, K. & H.J. Dumont, 2008. The 'true' genus *Alona* Baird, 1843 (Crustacea: Cladocera: Anomopoda): position of the *A. quadrangularis*-group and description of a new species from the Democratic Republic of Congo. *Zootaxa* 1943: 1-25.

Seen near Gaerwen, Anglesey
Thorough, but very slow apparently



From John Bratton

Cladocera Sueciae by Wilhem Lilljeborg 1816-1908

Members might like to know that this work published in 1900 can be freely read on line or downloaded from either of:

<http://www.archive.org>

<http://www.biodiversitylibrary.org/>

Both of which are extremely useful websites.

Comments on Newsletter 1

Should we use common names for Water Fleas?

There were just a couple of replies in favour - (but no name suggestions). Many more replies thought this a time wasting idea, we should stick to scientific names only.

Some useful free software:

Printscreen

Anything displayed on the computer screen e.g. webpage text & graphics can be instantly copied with Gadwin Printscreen. Screen grabs can be captured from the an exact area you want & saved in the format you define. Download from <http://www.gadwin.com/> (Choose the free not the professional option!)

GPS Trackmaker

Written by a South American mountain biker. Connect your GPS to your computer (needs a USB or serial link cable) and Trackmaker displays your Waypoints, Routes, Tracks etc. Highlight the ones you want, click a button to launch Google Earth and see your exact sites and routes on a satellite map. Use Printscreen (above) to paste an aerial map of your sites in a report. Again - choose the free not the professional option. <http://www.gpstm.com/dwlpag.php>

CEH Code List for Fresh Water Macroinvertebrates, from <http://www.ceh.ac.uk/data/freshwater-macroinvertebrates-codes.html>

New Members

Several new members have joined since the first edition was published and our membership now stands at 43 with several complimentary copies of the newsletter sent to various organisations.

A full up to date members list with contact details will be sent out to members shortly. No contact details will appear in this newsletter as it will be on the website for download.

Welcome to our 15 new members:

Rodney Harmsworth	Kay Van Damme
Ros Ponting	Fred Austin
Thomas Correll Jensen	Robert Muston
Dave Emson	Mike Gibson
Phillip Greaves	Christophe Brochard
Steve McWilliam	Dan Hoare
David Walker	Will Watson
Jean-Francois Cart	



Cladocera Interest Group Poster at Verbania, Italy
More information on our website

CONTACTS, COPY and RECORDS

With much to achieve this year we would like to produce the newsletter more frequently. Therefore we aim to distribute edition 3 at the end of the Summer so please send any copy by July 1st 2012 to the editors, Hannah Robson and Adrian Chalkley: admin@cladocera.org.uk
Your records of Cladocera to be sent to the NBN should be either filed on line at www.cladocera.org.uk emailed as a spreadsheet to records@cladocera.org.uk or posted on record cards RA32 from the CEH to:
Cladocera Records, 37 Brook Hall Road, Boxford, Sudbury, Suffolk CO10 5HS
Group organisers emails: hannah.robson@cladocera.org.uk & adrian.chalkley@cladocera.org.uk