# Zooplankton component

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This is the fourth official NMBAQC scheme zooplankton component ring-test, with the test occurring biennially. In December 2022, the Continuous Plankton Recorder (CPR) Survey, with the Marine Biological Association (MBA), on behalf of the NMBAQC scheme, sent out a call of interest for the fourth official zooplankton ring-test, to organisations and individuals known to be involved in zooplankton research and monitoring.

## Summary of activities

A ring test comprising of: 10, single taxon, tubed zooplankton specimens for identification (from the North Atlantic); 8 written questions and an enumeration exercise (counting of copepods and decapods), was sent out in Jan/Feb 2023. Sixteen participants, from eleven different laboratories signed up for the ring test (prior to completion one analyst withdrew from the test). All participants were from Europe, with 80% of participants from UK organisations. This year we welcomed two new laboratories from Germany to the Scheme.

Participants were given ten weeks to complete the written quiz and five weeks to complete the practical components (specimen ID and enumeration); results were assessed by the senior plankton analysts at the CPR Survey, Plymouth.

## Materials and methods

Specimen identification test: the CPR Survey acquired various mixed zooplankton net caught samples from different areas of the North Atlantic. From these samples, single species were picked and verified by an analyst, and subsequently confirmed by the Senior Analyst. Single taxa were then transferred to centrifuge tubes and the success of the transfer was checked. Where possible more than specimen of the same taxon was placed in each tube.

Written quiz: the quiz was prepared by the CPR Survey Senior Analyst and included photographs of taxa to be identified, together with general taxonomic questions related to zooplanktonic organisms.

Enumeration component: counting and basic identification of copepods and decapods. For the enumeration component*, Calanus finmarchicus* stage/sex-sorted specimens were supplied from culture by Biotrix, Norway; *Metridia* specimens from samples collected in the Norwegian Sea, by the Institute of Marine Research, Norway and brachyuran zoea from the L4 sampling station off Plymouth, collected by the MBA. Specimens were sorted, counted and tubed according to sex and stage. To help the sample look more like a natural/wild sample, other non-target organisms were included in the enumeration tube (e.g. cirripede larvae, non-brachyuran decapod zoea and non-*Calanus* copepods); these wild sample specimens were collected in Plymouth coastal waters. Prior to posting out to participants, contents were checked by the Senior Analyst with another experienced analyst as witness.

## Summary of results

Following on from participant feedback from previous NMBAQC zooplankton ring tests, the ring test should be community driven and ‘self-policed’. To help accomplish this, a two-day results and training workshop was organised and took place at the MBA, Plymouth, on the 20th and 21st July 2024. Fifteen participants, from eleven different laboratories took part in the workshop, where results were discussed and consensus for marking of results was reached.

The average result for the specimen identification section was 79.3%, slightly higher that than the previous year, with individual results ranging between 40% and 100%. The worst identified specimen was a Leptothecata hydrozoan medusa: the specimens belonged to either the genus *Clytia* or *Phialella*, and to tell them apart from each other, ideally fresh specimens are needed. Fine structures such as the marginal vesicles and concretions help to split these two organisms, but they often become difficult to observe in preserved material, for this reason identification in preserved specimens should be made with caution and limited to the broad grouping of Leptothecata. Approximately a quarter of participants approached the specimen with caution and gave the correct ID. The majority of other participants assigned the specimens to either *Clytia* or *Phialella*; interestingly with a near 50% split between the two, indicating the difficulty and confusion in correctly identifying this type of specimen. In contrast, a juvenile mysid was correctly identified by 100% of participants. Encouragingly, most participants (93%) were able to correctly identify the non-native copepod *Pseudodiaptomus marinus*.

For the written exercise, the average score was a 91.7%, a 10% improvement in the previous year; with individual marks ranging from 61.4% to 100%. The most poorly answered question concerned the identification a brachiopod larvae, with 25% of participants misidentifying it as a bivalvia larva.

Four questions scored 100%, with all participants gaining full marks; the subject of these questions concerned: identifying the larva of a hemichordate; identifying a juvenile scypho-medusa; recognizing an anchovy egg; and identifying the copepod *Isias clavipes*.

This year the enumeration section was made to look more like a wild sample. It included a set number of *Calanus* copepods at different life stages, a set number of brachyuran decapod zoea and was spiked with other common planktonic taxa, such as cirripede nauplii, non-brachyuran decapods, and other copepods such as *Oithona* and *Metridia*. The aim of the test was to assess counting expertise, together with basic copepod/decapod identification skills and ability to separate basic copepod life stages. Participants were asked to count *Calanus* and separate their different stages (e.g. adult female, adult male) and count the number of brachyuran zoea in the sample.  *Calanus* is an important component of North East Atlantic Zooplankton, so it is reasonable to expect that participants are able to separate it from other co-occurring similar sized taxa. Similarly brachyuran decapods are a common occurrence in coastal samples, an important part of the meroplankton and easily separated in appearance from other larval decapod groups. To give a statistical measurement of counting accuracy, a modified z-score was given for each required counting element. Adult female *Calanus* were counted with the most accuracy; however, individual scores ranged from a perfect z-score of 0 to 3.5; similarly for adult males z-scores ranged from 0 to 3.0. Perhaps surprisingly, brachyuran zoea also showed a wide variability in accuracy from 0 to 3.

## Training workshop

As well as discussing the results of the test, participants were given presentations and practical sessions on ichthyoplankton. Linford Mann from the Centre for Environment, Fisheries and Aquaculture Science (CEFAS), UK gave an interesting talk on the International Triennial England Mackerel Egg Survey with fish egg identification practical. Invited guest speaker, Nalani Schnell from the Muséum National d’histoire Naturelle, France, kindly delivered an informative lecture on “an introduction to fish larvae identification” followed by a practical session.

Other lectures also included “non-native news” and participants were also given the opportunity to deliver a short presentation about their work and laboratory.

1.5 Conclusions and Recommendations

The consensus amongst participants was that the zooplankton ring test was again deemed a success. It showed that the level of zooplankton identification amongst participants overall is very good, and that it provides a useful training exercise and opportunity to discuss problematic taxa.

For those outside of the UK, long postal delays (several weeks) were experienced in receiving the physical samples. Meaning that extensions to the results deadline had to be made. A discussion arose, at the workshop, about how we might overcome this issue in the future: should the test move to completely online, negating the need for physical specimens; or include a reverse test approach; or hold the test and workshop at the same time in Plymouth (i.e. participants would have to sit the test all together in one place)? A move to completely online, relying on drawings and images was not favoured. If postage becomes unreliable in the future, a move to all participants taking the test at the same time and same venue was thought of as a possible move forward.

A recommendation from the previous years test for the specimen ID component, was that an indication of where a specimen has been collected from would help with identification. This was included in this years test for specimens which have a distinctive distribution beyond just the broad level of NE Atlantic.

Of particular discussion was the lack of information in hyrdomedusa identification guides stating which features can/cannot be reliably used to identify preserved material.

Participants enjoyed the more “wild” looking nature of the enumeration sample and recommended this should be carried forward.

At the end of the results workshop, participants were again given an opportunity to give feedback on the ring test and training, both verbally and anonymously via a feedback form. The overall feeling was that participants found the test useful and enjoyable, saying that it challenged them at the right level; also, the length of time it took to complete the test was about right.