

REPORT OF THE  
SECOND ICES/HELCOM WORKSHOP/TRAINING COURSE  
ON PHYTOPLANKTON

Klaipeda, Lithuania  
12–15 October 1998

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## **1 OPENING OF THE WORKSHOP**

The Chair, Mrs Agneta Andersson-Nordström, opened the Workshop/Training Course of the Phytoplankton Expert Group, which was held at Hotel Parkas in Klaipeda, Lithuania from 12–15 October 1998. The director of the Centre of Marine Research in Klaipeda, Mr Algirdas Stankevicius, welcomed the participants on behalf of the hosts. The meeting was organised by Mrs Irina Olenina. Mr Norbert Wasmund was appointed rapporteur. The list of participants is attached as Annex 1 to this report.

The training course was composed of two parts: training on cyanobacteria (Cyanoprokaryota) on 12 October 1998 with Mrs Gertrud Cronberg as a teacher and training on small flagellates (Prymnesiophyceae, Chrysophyceae, Cryptophyceae, Prasinophyceae) on 13 October 1998 with Mrs Seija Hällfors and Mr Guy Hällfors as teachers. The two parts included a theoretical introduction and practical microscopical work on samples, brought over by the participants.

## **2 ADOPTION OF AGENDA**

After addition of the item 'intercalibration (ring test)', the preliminary agenda was accepted (Annex 2).

## **3 SUMMARY OF ACTIVITIES**

### **3.1 New Projects**

Applications for 3 projects were sent to HELCOM in September 1997:

- Training course for 2 years, 37 440 FIM.
- Updating and maintenance of counting programme for 3 years (2 months per year funded), 115 000 FIM.
- Creation of a new check list; funding for 3 months, 60 000 FIM.

All three project proposals were accepted by HELCOM. The activities of the projects are discussed later.

### **3.2 Biomass Sub-Group**

A sub-group on biomass estimations for particular phytoplankton species was established. A workshop on this theme was held in Klaipeda, Lithuania from 10–11 October 1998. Mrs Susanna Hajdu acted as Chair of the workshop and Mr Lars Edler as rapporteur. The protocol of that session is attached as Annex 3. The participants in the sub-group are indicated by an asterisk in Annex 1.

### **3.3 1997 Report of the ICES/HELCOM Workshop/Training Course on Phytoplankton**

A report from the 1997 phytoplankton expert meeting in Tvärminne, Finland was sent to HELCOM and ICES. It was published as ICES CM 1998/ACME:9.

The report contained suggestions for changes to the phytoplankton monitoring guidelines in the Baltic Sea. The group appreciated that HELCOM adopted most of the suggestions for changes in the new manual, especially the acceptance of the hose sampling method and the Finnish counting program, the addition of the Lund *et al.* (1958) reference, the insertion of Annex 1, the replacement of some old species names by new names, and changes in some biomass calculation formulas. The group was, however, disappointed about the rejection of the proposed change of the sampling depth (from 0–10 m to 0–20 m). Details on the Manual are discussed later (see Section 4).

### **3.4 Phytoplankton Identification Books**

The phytoplankton identification books (Pankow, Tikkanen and Willen, Thomsen), recommended for distribution to the Baltic countries, have not yet been delivered. HELCOM is requested to buy these books, as already proposed last year.

### **3.5 Phytoplankton Counting Program**

The Finnish counting program was distributed last year, but it is not used by all institutes collecting data for the BMP yet. This program will probably be adopted by the remaining institutes when the new Windows version is available.

### **3.6 Phytoplankton Website**

The home page of the phytoplankton group is now available but needs further development. It should include:

- an address list of group members, with separate lists for members working in BMP and cooperating members;
- a literature list, but this will not be necessary when the phytoplankton check list is finished and added to the home page, as it will contain a literature list;
- information on courses (information should be sent to Mrs Maija Huttunen, who will add it to the home page). Such information should also be sent to the group's mailbox;
- links to other home pages.

### **3.7 Phytoplankton Identification Sheets**

Phytoplankton identification sheets are under preparation by Mr Guy Hällfors. They will be linked to the check list.

### **3.8 Phytoplankton Expert Group Mailbox**

A mailbox for the members of the Phytoplankton Expert Group has been created (phyto-helcom@fimr.fi). E-mails sent to this address will be distributed to all members of the group.

### **3.9 IOC/NorFa Course**

Some group members took part in the IOC/NorFa course held in Tallinn, Estonia this year.

## **4 SUGGESTIONS TO THE MANUAL**

The group again discussed the matter of sampling depths and maintained its opinion that species and biomass can be missed if the integrated sample is not extended to 20 m depth.

Small changes in the text of the Manual are proposed in Annex 4.

In Chapter 5.2, a preservative should be recommended. The group proposes to add a note on the preservation method described by:

Jensen, M.O. 1998. A new method for fixation of unmineralized haptophytes for TEM (whole mount) investigations. *Journal of Phycology*, 34: 558–560.

Also a note on the health risks of preservatives should be added. Chapter 5.2 (on page C6-3), paragraph 2, should read as follows:

‘Neutralized formaldehyde gives incomparable results to Lugol’s solution and should not be used, except at a few coastal stations where long time series have already been established using formaldehyde. It is an allergen and injurious to the health.’

The table on settling time (page 4) should be rewritten because the settling times given in the present version are too short for quantitative settling. According to Mrs Gertrud Cronberg, a chamber height of 1 cm requires 4 hours of settling time—picoplankton needs twice the settling time. A line for a 25 ml chamber should be inserted. As a 100 ml chamber is not recommended, that line should be put in brackets.

For picoplankton, two additional sentences should be inserted under the table. They should read as follows:

Volume of chamber (ml)	Height of chamber (cm)	Minimum settling time (h) Lugol's solution
2	1	4
10	2	8
25	5	20
50	10	40
(100	20	80)

If picoplankton (< 2 µm) is counted, double the settling time. At these long settling times, take special care that evaporation is avoided (see above).

On page 5 of Annex C-6 of the Manual, counting units are recommended. However, there might be a difference between counted units and reported units, which can cause problems. An example of incorrect biomass of *Nodularia spumigena* in the HELCOM database was shown by Mrs Susanna Hajdu and Mrs Agneta Andersson-Nordström. Probably, in some cases the total filament length (in µm) was reported instead of the number of 100 µm pieces, leading to a hundred-fold overestimation. This error was reported to HELCOM, but without any response. It could be better to report total length (in µm) instead of 100 µm pieces, but this would require changes in the program. The group did not come to an agreement on this issue and decided to discuss it again next year. There is still the general question as to how to make changes in the HELCOM database. It should be possible in a formal procedure, i.e., only if the error can be verified.

In the table on objectives/oculars on page 6, an objective of 63x for picoplankton should also be allowed.

The group discussed whether the plasma volume calculation (see pages C-6-18 to C-6-19), which is a precondition for carbon calculation, should be kept in the Manual or not, since the calculation of carbon content is inaccurate and therefore not recommended. The group agreed that carbon calculation is a useful unit if better factors are available in future. To leave the option open, the calculation of carbon units should be kept in the counting program, since new factors can easily be introduced into it, improving the quality of carbon data. To have the possibility to calculate carbon content for old data in the future, plasma volume calculation should be kept in the Manual and plasma volume should be reported to the HELCOM database. (In special cases, if carbon calculation is needed, it could be done by the user with the help of the old carbon data, provided that the user is aware of the problems.)

To express that carbon is not used for phytoplankton biomass now, but is principally a useful unit if it can be more precisely calculated, the following sentence should be inserted before the last sentence of the introduction of Chapter 6.3 on page C-6-8:

'At present, there is no consensus in the literature regarding the calculation of phytoplankton carbon content. Since comprehensive carbon measurements in phytoplankton of the Baltic Sea are not known from the literature, carbon calculation is not recommended yet. To leave the option open for carbon calculations in the future, when improved factors will be available, it is recommended to calculate and report plasma volumes in addition to the cell volume.'

On page 20, the reference of Jensen (1998) [see above] must be added.

## 5 PHYTOPLANKTON CHECK LIST

Mr Guy Hällfors informed the group about his progress in creating a new check list.

The first pages already exist on the World Wide Web (<http://meri.fimr.fi>).

The species names also include the author and publication year. Basionym and all synonyms that have been used in the Baltic Sea literature will be added. A table of distribution in different Baltic Sea areas is given. The group discussed how gaps in described distributions should be filled (e.g., if a species is only described from the Belt Sea and the Gulf of Finland, should unpublished occurrences in the Baltic Proper also be assumed and indicated in the table or not?). The group agreed that for this purpose, unpublished data (e.g., from the HELCOM data bank) as well as published data should be used. However, it is necessary to check whether the data source is confidential. If a species list is sent to Mr Guy Hällfors, he will check it for possible errors. If it can be accepted, he will introduce the species occurrence in his check list.

From the species list, there will be links to pictures of the algal species.

During the past year it was determined that three months of funding for creating a new phytoplankton check list was not sufficient. The 'Algaline' project of the FIMR has given additional money and still supports the check list, but an application for additional support from HELCOM is necessary.

## **6 COUNTING PROGRAM**

Mrs Maija Huttunen proposed that:

- the species list, belonging to the phytoplankton counting program, be expanded to comprise all species potentially occurring in the Baltic Sea area, including RUBIN codes, size classification, and cell volumes;
- the computer program be converted to the Windows environment, so that modern computer capabilities can be adopted into the counting protocol;
- the RUBIN code be maintained until the new taxonomic coding system is decided by ICES/HELCOM.

Presently, the counting program is only used by Finland (Mrs Maija Huttunen, Mrs Pirkko Kokkonen) and Germany (Mr Norbert Wasmund). Mrs Iveta Ledaine, Elzbieta Niemkiewicz, Andres Jaanus, Inga Kasonina and Mrs Irina Olenina have tried it. They face the problem that the data output format cannot be used for their own data files. Mrs Agneta Andersson-Nordström, Mr Lars Edler and Mrs Susanna Hajdu still use Macintosh; thus it is a big step to change to a new system.

One disadvantage of the present program is that it is not possible to edit the protocol after completing the count.

Mrs Maija Huttunen reported that every country may have to pay for the change of the counting program. Leena Kahma, who created the program, received 10 000 FMK for changing the program to the Windows environment, but this is not enough to be able to make all the necessary changes. Mrs Maija Huttunen will continue the work on the phytoplankton list ('phytopla.dat') and send it out for comments. She informed the group about a new e-mail address to Mrs Leena Kahma: kahma@helsinki.fi (subs: Leena Kahma).

## **7 REPORT FROM THE BIOMASS SUB-GROUP**

The activities and decisions of the biomass sub-group were reported to the entire group by Mrs Susanna Hajdu, the convener of the sub-group (see Annex 3).

Susanne Hajdu pointed out that more measurements of the hidden dimensions are needed and asked the members of the Phytoplankton Expert Group to send such data to her. The biomass sub-group would like to collect more data on cell dimensions of dominating species from different areas of the Baltic Sea. These data will form the basis for the division into size classes of the species and provide the possibility to find geographical differences of cell dimensions. She encouraged the group to send data on average, maximum, minimum, and standard deviation of the measurements (length, width, and other important parameters), together with dates of sampling, area of sampling, number of measurements, salinity, water temperature, geometric formula used, and volume per cell. At least 50 cells should be measured and the data should be sent to Mrs Iveta Ledaine, who will collect the data in an EXCEL file. Mrs Gertrud Cronberg thinks that nutrient concentrations should also be reported with the cell measurements, at least if there is an intention to publish the data. The scale unit in ocular should not exceed 2.5 µm for objective 100x.

The group (at least the biomass sub-group) should try to publish results of the joint work, e.g., in the European Journal of Phycology, the Journal of Plankton Research, Algological Studies, Boreal Environment Research, Ophelia or International Revue der gesamten Hydrobiologie.

An additional two-day meeting of the biomass sub-group is needed at the beginning of 1999.



## 8 INTERCALIBRATION

The group agreed that an intercalibration (ring test) of the counting method is useful and necessary.

Mrs Gertrud Cronberg and Mr Norbert Wasmund cautioned about carrying out an intercalibration in a superficial way, as is sometimes done. A clear concept, a manual, and statistical tools are needed as well as an awareness that conflicting results may be found. Finally, appropriate steps must be taken to overcome discrepancies in results. Mrs Gertrud Cronberg's publication on carrying out an intercalibration must be read prior to taking action.

Mrs Agneta Andersson-Nordström will prepare a proposal for an intercalibration exercise (together with Mr Norbert Wasmund, as well as the experience of Ms Gertrud Cronberg and Mrs Seija Hällfors).

Some doubts were expressed about whether it is practical to carry out an intercalibration already next year. This should include the new counting program and it is important that all participants receive the new manual and become familiar with the program before an intercalibration exercise is carried out.

Ultimately, the group decided to apply for a special project so that the intercalibration exercise can be carried out in 2000.

## 9 NEXT MEETING

The 1999 meeting of the group was proposed for the Laboratory of the Swedish Royal Society in Abisko (Northern Sweden) in early September. In contrast to the plan for last year, the training course should be on Chlorophyceae (by Mr Komarek) and *Chaetoceros* (by Mrs Jensen). Mrs Andersson-Nordström will ask Mr Juha-Markku Leppänen and Mr Kjell Grip whether they agree to such a change in the previous plan. After the course of study is agreed, the teachers will be formally invited.

## 10 CLOSING OF THE WORKSHOP

After acknowledging the local organiser, Mrs Irina Olenina, and the teachers, Mrs Gertrud Cronberg and Mr Guy Hällfors, for their valuable contributions and thanking the group for their active participation, the Chair, Mrs Agneta Andersson-Nordström, closed the Workshop.

## ANNEX 1

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\*Participants in the meeting of the Biomass Sub-Group.

## **ANNEX 2**

### **AGENDA**

- 1) Opening of the workshop.
- 2) Adoption of the agenda.
- 3) Activities.
- 4) Suggestions to the Manual.
- 5) Phytoplankton check list.
- 6) Counting program.
- 7) Report from the biomass sub-group (including discussion).
- 8) Intercalibration (ring test).
- 9) Future meeting.
- 10) Closing of the workshop.

## ANNEX 3

### REPORT OF THE BIOMASS SUB-GROUP OF THE ICES/HELCOM WORKSHOP/TRAINING COURSE ON PHYTOPLANKTON

10–11 October 1998

#### *Opening of the meeting*

The meeting was opened on 10 October 1998 in Klaipeda, Lithuania by the Chair, Ms Susanna Hajdu. Mr Lars Edler was appointed as rapporteur.

The following persons took part in the discussions: Irina Olenina, Agneta Andersson-Nordström, Maija Huttunen, Maija Niemelä, Pirkko Kokkonen, Reija Jokipii, and Norbert Wasmund.

#### *Objectives*

The objectives for the sub-group, that biomass data and size classes for phytoplankton species in the HELCOM area should be included in the PHYTOPLA.DAT counting program, were reiterated. Considerable work on this has already been done, but there is still more to do. The work that has been completed is also included in the new *Manual for Marine Monitoring in the COMBINE Programme of HELCOM* (version 1.0, Revised June 1998).

#### *Biomass Calculations*

The group discussed the possibility that newly adapted formulas for the biomass calculation may deviate considerably from the old formulas. If so, this will influence the long time series of phytoplankton in the HELCOM data series. In order to check this, it was decided to compare volume values of those species where changes have been made, to determine the size of the discrepancy and, based on these findings, to decide on an acceptable deviation.

For six species/genus, the percentage subtracted from the calculated volume has been changed. The change is generally about 10%. The group found this change acceptable. There is no need to make changes in the old data for these species. These species are listed in Table A3.1.

Formula changes have been made for seven species or genera. The deviation varies considerably (see Table A3.1.A). Some species show a very large deviation (300–1300%) and the group found it necessary to reconsider the new formulas. These species are listed in Table A3.1.B. Each group member is asked to consider the formulas and give their opinion as to whether they should be kept or changed. A change of up to about 20% may be acceptable.

At the same time, it was stressed that, if the group finds a new formula that fits the species better than the old formula, the change must be done. It is not meaningful to keep an incorrect formula because old data were calculated from it.

It was decided that, when the group has agreed on new formulas for the phytoplankton species, the group should agree on a date from which the new formulas should be in effect.

#### *Size Classes*

Each phytoplankton expert is supposed to provide Ms Maija Huttunen with measures and calculations of species from their own area. In order to do this, however, an agreement on the size classes to be used is necessary. An agreement on the 'HIDDEN DIMENSION' (HD) is also necessary.

The sub-group discussed and agreed on size classes for about 15 species/genera/groups (Table A3.2). While doing this, several small mistakes in Table C.6.3 of the COMBINE Manual were found and corrected. It was decided that the entire Table C.6.3, including the formulas and figures, should be updated by Ms Maija Huttunen and Mr Lars Edler.

A suggestion for size classes of *Ceratium* species, based on Danish measurements (Plankton i de indre farvande. Havforskning fra Miljøstyrelsen. Nr. 11. 1992), was discussed and adopted (Table A3.3).

Measurements of cell dimensions for a number of species from different areas of the Baltic Sea were compiled and discussed by the group. More data will be added to the list and the results will form the basis for the deviation into size classes of these species. Mrs P. Kokkonen and Mr N. Wasmund have carefully checked the list and it became clear that more work on this is needed.

All formulas used for the calculation of species volumes were checked and stored in an EXCEL file. This will serve as the basis for future calculations of species volumes.

It was requested that dimensions (length, width, diameter, etc.) should be inserted into the PHYTOPLA.DAT counting program.

#### *Phytoplankton Counting Program*

A number of suggestions to improve the counting program were indicated.

- a) The program should have a loop. If you find a species that does not fit into the formula/volume given for this species in the program, it should be possible to enter your own measured values directly. The program should then be able to use these measures for the calculation immediately and report these data to HELCOM. This would give the program greater flexibility. The new measures should not be added directly into the overall program. Instead, the phytoplankton expert, finding these measures, should find out if the new measures are repeated regularly. If so, they should be inserted in the overall program after some years.
- b) The group was of the opinion that the transformation of volume values into carbon should be kept in the program. However, it is important that transformation factors for both plasma volume and carbon content are possible to be changed within the program.

The group was informed that the program will contain the entire check list and that it will be possible to select the group of species that are most common in the area of the phytoplankton expert.

With the new sampling and analysing strategy which in short means that one country will analyse all samples from a certain station, it is of great importance that the delivered samples are accompanied with protocols which clearly indicate station, location, date, etc., i.e., good meta data.

**Table A3.1.** Changes of volumes for phytoplankton species, as suggested by the ICES/HELCOM Phytoplankton Expert Group.

**A.** Species/genus with changed percentage subtraction from the calculated volume.

Species	New formula	% change from old formula
<i>Noctiluca miliaris</i>	sphere – (10–20%)	10–20%
<i>Protoperidinium depressum</i>	(cone + 2 cones) – 40%	10%
<i>Protoperidinium pallidum</i>	(cone + sphere/2) – (20–30%)	10%
<i>Protoperidinium pellucidum</i>	(cone + sphere/2) – (20–30%)	10%
<i>Scrippsiella</i> spp.	sphere – (10–40%) or (? sphere + cone)	10–40%
<i>Polykrikos</i> spp.	cylinder – 10%	10%

**B.** Species/genus with changed formula.

Species	New formula	% of old formula	Accepted
<i>Dinophysis acuminata</i>	ellipsoid	300%	? <sup>1*</sup>
<i>Protoperidinium bipes</i>	trapezoid + cone/2 or cone – 50%	1300%	No
<i>Gymnodinium simplex</i>	sphere – 10%	90%	Yes
<i>Dichtyocha</i> spp.	sphere/2	70%	?
<i>Attheya</i> spp.	cylinder	100%	Yes
<i>Qdontella</i> spp. ( <i>Biddulphia</i> )	cylinder – (20–30%)	280%	No <sup>2*</sup>
<i>Hantzschia</i>	parallel epiped	60%	? <sup>3*</sup>

<sup>1\*</sup> For *Dinophysis acuminata* another formula has been suggested:

Species	New formula	% of old formula	Accepted
<i>Dinophysis acuminata</i>	rotational ellipsoid with elliptic cross section	200%	

The result of this formula is still far from the old one. However, the cell form of *Dinophysis acuminata* is more equivalent to this one than any of the others, so it is fair to say that it is probably the most accurate formula we can find.

<sup>2\*</sup> *Odontella* seen in every book has the form of an ellipsoid, so I see no reason to change.

<sup>3\*</sup> The old formula would be good enough for this very rare species.

**Table A3.2.** Changes to Table C.6.3 of the COMBINE Manual and size class designations for selected species and groups of species.

Table C.6.3. Stereometrical formulas for common phytoplankton taxa in the Baltic Sea and size classes.

- a) Add formula for *Chrysochromulina* - Prasinophyceae: Sphere or Rotational Ellipsoid with circular cross section
- b) Add formula for Unidentified Thecal and Naked Dinoflagellates:
  - Sphere – (10–20 %)
  - 2 cones
  - Rotational Ellipsoid with circular cross section – (20 % or more)
- c) Add formula for Unidentified Monads and Flagellates
  - Sphere
  - Rotational Ellipsoid with circular cross section
- d) Formula for *Mesodinium rubrum*:
  - 2 Spheres –20 % < 30 µm
  - Sphere > 30 µm

'Ciliates with endosymbiotic algae' should be changed to 'Photosynthetic ciliate'

Size classes.

CENTRIC DIATOMS:	size class	calculation performed at	
	3–7	5	
	7–12	10	
	12–20	15	
	FACTOR Pervalvar axis / apical axis:	20–60 µm:	0.5
		> 60 µm:	0.3
<i>Actinocyclus octonarius</i>	size class	calculation performed at	
	20–30	25	
	30–40	35	
	40–50	45	
	50–60	55	
	60–70	65	
	70–90	80	
	90–110	100	
FACTOR Pervalvar axis / apical axis:	< 50 µm:	0.95	
		> 50 µm:	0.65
<i>Coscinodiscus</i> spp.	size class	calculation performed at	
	50–60	55	
	60–70	65	
	70–90	80	
	90–110	100	
	110–130	120	
FACTOR Pervalvar axis / apical axis:	50–80 µm:	0.6	
	80–100 µm:	0.5	
	> 100 µm:	0.45	
<i>Coscinodiscus granii</i>	size class	calculation performed at	
	50–70	60	
	70–90	80	
	90–110	100	
	110–130	120	
	130–150	140	
	150–170	160	
	FACTOR Pervalvar axis / apical axis:	< 100 µm:	0.66
	100–130 µm:	0.60	
	> 100 µm:	0.48	



Table A3.2. Continued.

<i>Coscinodiscus radiatus</i>	size class	calculation performed at
	50-70	60
	70-100	85
	????????	180
	FACTOR Pervalvar axis / apical axis:	60 µm: 0.19 85 µm: 0.15 180 µm: 0.11
<i>Thalassiosira baltica</i>	size class	calculation performed at
	20-30	25
	30-40	35
	40-50	45
	50-60	55
	60-70	65
	70-90	80
	90-110	100
FACTOR Pervalvar axis / apical axis:	20-60 µm: 0.5 > 60 µm: 0.3	
<i>Chaetoceros danicus</i>	size class	calculation performed at
	15-20	17.5
	16 × 17	
FACTOR Pervalvar axis / apical axis:	0.75	
<i>Chaetoceros wighamii</i>	size class	FACTOR Pervalvar axis / apical axis:
	6 × 5	0.85
	10 × 9	0.85
	13 × 7	0.70
	16 × 8	0.60
<i>Achnanthes taeniata</i>	size class	FACTOR Pervalvar axis / apical axis:
	15 × 5 × 5	0.4
	18 × 6 × 6	0.3
<i>Chrysochromulina</i> spp.	size class	
	2-4 µm	
	4-6 µm	
	6-10 µm	
Unidentified Thecal and Naked Dinoflagellates	size class	
	< 10 µm	
	10-15 µm	
	15-20 µm	
	20-30 µm	
	30-40 µm	
	40-50 µm	
	50-70 µm	
> 70 µm		
Unidentified Monads and Dinoflagellates	size class	
	2-3 µm	
	3-5 µm	
	5-7 µm	
	7-10 µm	
	10-15 µm	
	15-20 µm	

Table A3.2. Continued.

<i>Mesodinium rubrum</i>	size class	calculation performed at
	10–15 µm	12.5
	15–20 µm	17.5
	20–25 µm	22.5
	25–35 µm	30
	35–45 µm	40
	45–55 µm	50
	55–65 µm	60

Table A3.3. Size classes of *Ceratium* species.

Species	Singular cell length (µm)	Corresponding cell volume (µm <sup>3</sup> )	Width (µm)
<i>Ceratium furca</i>	< 45		30 000
	<u>45–55</u>	<u>250</u>	<u>50 000</u>
	> 55		75 000
<i>Ceratium fusus</i>	<u>&lt; 25</u>	<u>&lt; 500</u>	(x = 300 × 22) <u>18 000</u>
	> 25	> 500	(x = 500 × 30) 25 000
<i>Ceratium hirundinella</i>		size classes ?	50 000–60 000
<i>Ceratium horridum</i>	50	250	50 000
<i>Ceratium lineatum</i>	< 35	110 × 33	12 000
	35–45		18 000
	> 45		28 000
<i>Ceratium longipes</i>	< 55		50 000
	>55		85 000
<i>Ceratium macroceros</i>		400 × 50	60 000
<i>Ceratium tripos</i>	< 70		90 000
	70–80	250–275	135 000
	> 80		160 000

## ANNEX 4

**PROPOSED CHANGES TO ANNEX C-6 OF THE  
MANUAL FOR MARINE MONITORING IN THE COMBINE PROGRAMME OF HELCOM  
VERSION 1.0–REVISED JUNE 1998**

Page	Chapter/ Paragraph	Line or Sentence	Present phrasing	Recommended phrasing
C6-1	2/a	2	abundance of blooms	frequency of blooms
C6-1	3/1	line 6	deals sea ground truth measurements	deals with sea water measurements
C6-2	paragraph 4	1	net sample from the 0–20 m water column in order ...	net sample in order ...
C6-4	paragraph 4	line 4	otherwise	Otherwise
C6-4	'Counting procedure'	1	In order to save time and to achieve a reasonable accuracy in counting, the sedimented sample should first be examined for general distribution ...	In order to save time, it is allowed/recommended to count a defined part of the sedimented sample. To achieve a reasonable accuracy in counting, the sedimented sample should first be examined for general distribution ...
C6-4	'Counting procedure'	sentence 2	<b>Shift the sentence</b> All species found should be listed and counted using the HELCOM counting software. <b>to:</b> Page C6-5, 2nd paragraph, 1st line (i.e., before the sentence, 'How much of the chamber area ...')	
C6-6		line 17	100×	63× or 100×
C6-7	'Cleaning of the sedimentation chambers'	lines 5–6	<b>delete the sentence:</b> The sedimentation chamber may also be cleaned with 95 % ethanol.	
C6-8		line 11	<u>phyto-plankton</u>	<u>phytoplankton</u>
C6-8		lines 19–20	to (Melvasalo Kononen <i>et al.</i> , 1983).	to Melvasalo Kononen <i>et al.</i> , 1984.
C6-20	reference of Kononen <i>et al.</i>		1983 Limnologica 15/2.	1984 Limnologica 15/2: 605–614.
C6-20	reference of Leppänen <i>et al.</i>		And Laine	and Laine
C6-24	paragraph 2	lines 3–4	Cyanophyceae, Nostocophyceae or Cyanobacteria	Myxophyceae, Cyanophyceae, Nostocophyceae, Cyanobacteria or Cyanoprokaryota

