**Task 4.1 Calibration**

**Overview of the calibrating facility**

Contact Details

NAME/DESIGNATION (if any): *Manolis Ntoumas, Calibration Lab Responsible*

MANAGING INSTITUTE/ORGANIZATION: *Hellenic Centre for Marine Research*

DEPARTMENT (if any): *Institute of Oceanography*

ADDRESS: *Thalassocosmos-Former US base at Gournes,* *P.O. Box 2214 HERAKLION CRETE*

COUNTRY: *Greece*

TEL: *+30 2810 337755*

FAX: *+30 2810 337822*

Name of contact-person: *Petihakis George*

E-mail: *gpetihakis@hcmr.gr*

Part a: General Information

 1. Does your calibrating facility possess a well-defined organizational framework with

Dedicated staff? **Yes**

Clear hierarchy? **Yes**

Transparent chain of responsibility for management, technical/scientific

and operational decisions)? **Yes**

 2. Briefly describe the size and nature of the annual operating budget of your facility.

Is it funded by your Institute/Centre? **Yes**

 If **Yes,** is the funding constant? **Yes**

Is it funded by Projects? **Yes**

Is there separate funding for upgrading or acquiring new instrumentation, etc.?  **No**

(Kindly provide an estimate of the annual operating budget and any additional information you think may be helpful below)

*50.000***€***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(Add lines as necessary)

 3. Does your facility employ Quality Management Standards - ISO 9000:2000,

ISO 10012, Good Laboratory Practice (GLP), and the like - to its calibration

systems?  **No**

 4. Does your facility possess any kind of accreditation for the calibrations?  **No**

(If **Yes**, please specify the parameter/s or measurand/s concerned, the kind

of accreditation and the issuing body below)

 5. Does your facility actively endorse a policy of continual training/education of

personnel actively involved in calibration activity? **Yes**

(If **Yes**, please provide a brief description of the kind of activities promoted below).

 *Participation in international workshops and calibration experiments. Organizing and performing calibration experiments with national partners and associates (e.g University of Aegean, Technical Institute of Athens).*

 6. Does your facility maintain a documented in-house Quality Assurance Programme? **Yes**

 7. Does your facility maintain a formal Quality Manual (containing, at the

very least, listings and descriptions of equipment and procedures,

maintenance/calibration records and certificates for instrumentation, and

safety precautions and regulations)? **Yes**

 8. Does your facility make use of control charts (Shewhart Charts, other) for

Quality Control purposes? **No**

 9. Can your facility assure an effective traceability chain to primary standards or,

in their absence, to conventionally accepted reference material (certified or

otherwise)? **Yes**

10. Does your facility furnish uncertainty estimations for its calibration systems? **No**

11. Does your facility maintain links of any kind with the National Metrology

Institute/s (NMI/s) of your country? **No**

12. In the list of sensors below, please indicate only the ones that you currently **never** calibrate yourselves; in each case, kindly report the calibration provider (manufacturer, other) and the typical calibration interval (trimonthly, half-yearly, yearly, other) you are presently employing.

*Physical sensors for*:

 Temperature, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Conductivity (Salinity), \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Dissolved oxygen, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Water Currents, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Pressure, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Optical sensors for*:

 Chlorophyll a, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Turbidity, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Photosynthetically Active Radiation (PAR), \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Chemical sensors for*:

 Phosphates, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Silicates, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Nitrates, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Nitrites, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Ammonia, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Dissolved oxygen, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 pH, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Total alkalinity, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

⌧ Total carbon dioxide, Calibrated by

 Contros once a year. Dissolved organic carbon,

Total organic carbon, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Please complete the questionnaire using the forms furnished in the following pages to provide details regarding your calibration practices for all the sensors in the above list that you do calibrate routinely*.**

**Task 4.1.1 Physical Sensors**

(\* Please provide a separate sheet for each parameter)

Part b: Calibration

Parameter/measurand\*: *Temperature*

Unit of measurement*: degrees C*

Range: *-5 to +35 °C*

Accuracy: *0.001 °C*

Precision: *0.000025 °C*

Calibration uncertainty (if available): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How often do you calibrate the sensor/s or sensor system/s you are presently using for the specified parameter/measurand: please list the typical calibration interval/s you are employing; note that if you are calibrating irregularly, kindly specify why and when (e.g. before a deployment, following a malfunction, etc.).

*The temperature sensors of the HCMR are calibrated twice a year (6 month interval).*

1. Please provide a brief description of the calibration setup, including a list of the principal equipment, reference material (certified and/or conventionally accepted) and instrumentation involved in a typical calibration operation.

*- Baths (1 Seawater Heating Tank -1.100 lt, 1 Sea/Fresh water Temperature Controlled Bath -120 lt)*

 *- Deep Ocean Standards Thermometer SBE 35 as temperature reference sensor*

 3. Do you employ reference material which are mutable or unstable

(e.g. secondary standards, reagent solutions, gas mixtures,

pressure generators, etc.) to calibrate the sensor/s or sensor system/s

you are presently using for the specified parameter/measurand **No**

 4. In your view, does your facility ensure an effective traceability chain for the

specified parameter/measurand? **Yes**

 5. Please provide a brief description of the procedures employed to ensure adherence of the performances of the principal equipment and reference instrumentation of the calibration setup to factory specifications (in-house monitoring of performance, in loco re-calibration, servicing by the manufacturer, etc.).

*The performance of the SBE 35 reference thermometer is monitored in house and it is calibrated and serviced by the manufacturer at regular intervals (2 years).*

 6. Does your facility maintain a Manual with a description of the calibration method

and the measuring procedures, together with details of sample treatment and

preparation when these steps are present? **Yes**

 (Add lines as necessary)

 7. In your view, is regular factory calibration/servicing necessary to obtain

optimal performances from your sensors/instrumentation for the

specified parameter/measurand in the field?  **No**

 8. Do you perform field calibrations for the specified parameter/measurand? **Yes**

(If **Yes**, please provide a brief description of the method and procedures)

*The temperature sensors of the HCMR are field validated and calibration corrections are applied if necessary.*

 9. Does your facility perform:

* internal quality audits to monitor and assess its

 calibration system for the specified parameter? **Yes**

 - independent quality audits to monitor and assess its

 calibration system for the specified parameter?  **No**

(If **Yes** to any of the above, please provide a brief description of the procedure/s applied, including a list of the principal equipment and instrumentation involved)

 *The behaviour of the sensors, deployed in the field after the calibration, is monitored by monthly comparison against survey data.*

10. Does your facility actively maintain an archive containing issued calibration

reports/certificates for the specified parameter/measurand? **Yes**

(If **Yes**, please specify the document retention time/s)

*The certificates are issued every six months and the retention time is 18 months.*

11. Do you have any suggestions or ideas for improving the quality of your

calibrations for any particular sensor/sensor system you are presently using

for the specified parameter/measurand (e.g. innovative reference material,

modifications to existing methodologies or new methodologies

you have developed, etc.)? **Yes**

(if **Yes**, please provide a brief description of your ideas and/or suggestions, including the details of the sensor/s or sensor system/s)

*The fitting procedure of the calibrated sensor data against the reference data is aiming to compute a set of new coefficients for the sensor. Furthermore more fitting techniques can be tested in order to minimize the sensor drift.*

12. Do you have any suggestions or ideas for improving the general quality

of the calibration of sensors or instruments for measuring the specified

parameter/measurand (e.g. testing and promoting the use of new

reference material, development of new methodologies, etc.)?  **No**

Submitted on: \_\_21/12/2011\_\_\_\_\_\_\_

 (Date)

Compiled by: \_Manolis Ntoumas\_

 (Name of respondent)

**Task 4.1.1 Physical Sensors**

(\* Please provide a separate sheet for each parameter)

Part b: Calibration

Parameter/measurand\*: *Conductivity/Salinity*

Unit of measurement*: ppt*

Range: *0.005 to 42 ppt*

Accuracy: *0.003 ppt*

Precision: *0.0002 ppt*

Calibration uncertainty (if available): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How often do you calibrate the sensor/s or sensor system/s you are presently using for the specified parameter/measurand: please list the typical calibration interval/s you are employing; note that if you are calibrating irregularly, kindly specify why and when (e.g. before a deployment, following a malfunction, etc.).

*The conductivity sensors of the HCMR are calibrated twice a year (6 month interval).*

1. Please provide a brief description of the calibration setup, including a list of the principal equipment, reference material (certified and/or conventionally accepted) and instrumentation involved in a typical calibration operation.

*- Baths (1 Seawater Heating Tank -1.100 lt, 1 Sea/Fresh water Temperature Controlled Bath -120 lt)*

*- AutoSal 8400A Salinometer as salinity reference*

 *- Deep Ocean Standards Thermometer SBE 35 as temperature reference sensor*

 3. Do you employ reference material which are mutable or unstable

(e.g. secondary standards, reagent solutions, gas mixtures,

pressure generators, etc.) to calibrate the sensor/s or sensor system/s

you are presently using for the specified parameter/measurand **Yes**

(if **Yes**, please list the types of this kind of reference material you are employing; kindly specify also the measures you take to guarantee the reliability of the reference material in terms of batch-to-batch uniformity of characteristics)

*We are using OSILs SSW in order to standardize the salinometer before the calibration experiment.*

 4. In your view, does your facility ensure an effective traceability chain for the

specified parameter/measurand? **Yes**

 5. Please provide a brief description of the procedures employed to ensure adherence of the performances of the principal equipment and reference instrumentation of the calibration setup to factory specifications (in-house monitoring of performance, in loco re-calibration, servicing by the manufacturer, etc.).

*The performance of the AutoSal 8400A Salinometer is monitored in house and it is calibrated and serviced by the manufacturer when there is an indication of significant drift or instability.*

 6. Does your facility maintain a Manual with a description of the calibration method

and the measuring procedures, together with details of sample treatment and

preparation when these steps are present? **Yes**

 (If **Yes**, kindly attach a copy to the completed questionnaire, otherwise please provide a short, description below)

 7. In your view, is regular factory calibration/servicing necessary to obtain

optimal performances from your sensors/instrumentation for the

specified parameter/measurand in the field?  **Yes**

(If **Yes**, please provide details of the sensors/instrumentation, indicating also the intervals you recommend for factory calibration/servicing, below).

*Conductivity cells are sensitive to biofouling and should be serviced (hard cleaning, cell replatinized) at least every 5 years.*

 8. Do you perform field calibrations for the specified parameter/measurand? **Yes**

(If **Yes**, please provide a brief description of the method and procedures)

*The conductivity sensors of the HCMR are field validated and calibration corrections are applied if necessary.*

 9. Does your facility perform:

* internal quality audits to monitor and assess its

 calibration system for the specified parameter? **Yes**

 - independent quality audits to monitor and assess its

 calibration system for the specified parameter?  **No**

(If **Yes** to any of the above, please provide a brief description of the procedure/s applied, including a list of the principal equipment and instrumentation involved)

 *The behaviour of the sensors, deployed in the field after the calibration, is monitored by monthly comparison against survey data and samples.*

10. Does your facility actively maintain an archive containing issued calibration

reports/certificates for the specified parameter/measurand? **Yes**

 (If **Yes**, please specify the document retention time/s)

*The certificates are issued every six months and the retention time is 18 months.*

11. Do you have any suggestions or ideas for improving the quality of your

calibrations for any particular sensor/sensor system you are presently using

for the specified parameter/measurand (e.g. innovative reference material,

modifications to existing methodologies or new methodologies

you have developed, etc.)? **Yes**

(if **Yes**, please provide a brief description of your ideas and/or suggestions, including the details of the sensor/s or sensor system/s)

*The fitting procedure of the calibrated sensor data against the reference data is aiming to compute a set of new coefficients for the sensor. Furthermore more fittings techniques can be tested in order to minimize the sensor drift.*

12. Do you have any suggestions or ideas for improving the general quality

of the calibration of sensors or instruments for measuring the specified

parameter/measurand (e.g. testing and promoting the use of new

reference material, development of new methodologies, etc.)?  **No**

Submitted on: \_\_21/12/2011\_\_\_\_\_\_\_

 (Date)

Compiled by: \_Manolis Ntoumas\_

 (Name of respondent)

**Task 4.1.1 Physical Sensors**

(\* Please provide a separate sheet for each parameter)

Part b: Calibration

Parameter/measurand\*: *Dissolved oxygen*

Unit of measurement*: ml/l*

Range: 0-100% saturation, 0-8 ml/l

Accuracy: *± 0.01ml/l (Winkler analysis)*

Precision:

Calibration uncertainty (if available): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How often do you calibrate the sensor/s or sensor system/s you are presently using for the specified parameter/measurand: please list the typical calibration interval/s you are employing; note that if you are calibrating irregularly, kindly specify why and when (e.g. before a deployment, following a malfunction, etc.).

*The DO sensors of the HCMR are calibrated twice a year (6 month interval).*

1. Please provide a brief description of the calibration setup, including a list of the principal equipment, reference material (certified and/or conventionally accepted) and instrumentation involved in a typical calibration operation.

*- 1 Sea/Fresh water Temperature Controlled Bath -120 lt*

*- 2 Small incubation containers- 20lt*

 *- Deep Ocean Standards Thermometer SBE 35 as temperature reference sensor*

 *- Winkler analysis*

 3. Do you employ reference material which are mutable or unstable

(e.g. secondary standards, reagent solutions, gas mixtures,

pressure generators, etc.) to calibrate the sensor/s or sensor system/s

you are presently using for the specified parameter/measurand **No**

 4. In your view, does your facility ensure an effective traceability chain for the

specified parameter/measurand? **Yes**

 5. Please provide a brief description of the procedures employed to ensure adherence of the performances of the principal equipment and reference instrumentation of the calibration setup to factory specifications (in-house monitoring of performance, in loco re-calibration, servicing by the manufacturer, etc.).

*The performance of the SBE 35 reference thermometer is monitored in house and it is calibrated and serviced by the manufacturer when there is an indication of significant drift.*

 6. Does your facility maintain a Manual with a description of the calibration method

and the measuring procedures, together with details of sample treatment and

preparation when these steps are present? **Yes**

 7. In your view, is regular factory calibration/servicing necessary to obtain

optimal performances from your sensors/instrumentation for the

specified parameter/measurand in the field?  **Yes**

(If **Yes**, please provide details of the sensors/instrumentation, indicating also the intervals you recommend for factory calibration/servicing, below)

*Due to the sensitivity of the sensors to aging the SBE 43 DO sensors should be serviced by the manufacturer at regularly 2-3 years intervals.*

 8. Do you perform field calibrations for the specified parameter/measurand? **Yes**

(If **Yes**, please provide a brief description of the method and procedures)

*The DO sensors of the HCMR are field validated and calibration corrections are applied if necessary.*

 9. Does your facility perform:

* internal quality audits to monitor and assess its

 calibration system for the specified parameter? **Yes**

 - independent quality audits to monitor and assess its

 calibration system for the specified parameter?  **No**

 *The behaviour of the sensors, deployed in the field after the calibration, is monitored by monthly comparison against survey data and samples.*

10. Does your facility actively maintain an archive containing issued calibration

reports/certificates for the specified parameter/measurand?  **No**

11. Do you have any suggestions or ideas for improving the quality of your

calibrations for any particular sensor/sensor system you are presently using

for the specified parameter/measurand (e.g. innovative reference material,

modifications to existing methodologies or new methodologies

you have developed, etc.)? **No**

12. Do you have any suggestions or ideas for improving the general quality

of the calibration of sensors or instruments for measuring the specified

parameter/measurand (e.g. testing and promoting the use of new

reference material, development of new methodologies, etc.)?  **No**

Submitted on: \_\_21/12/2011\_\_\_\_\_\_\_

 (Date)

Compiled by: \_Tatianna Tsagaraki\_

 (Name of respondent)

**Task 4.1.2 Optical Sensors**

(\* Please provide a separate sheet for each parameter)

Part b: Calibration

Parameter/measurand\*:Turbidity

Unit of measurement: NTU

Range: *0.01 to 25 NTU*

Accuracy: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Precision: *0.01 NTU*

Calibration uncertainty (if available): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How often do you calibrate the sensor/s or sensor system/s you are presently using for the specified parameter/measurand: please list the typical calibration interval/s you are employing; note that if you are calibrating irregularly, kindly specify why and when (e.g. before a deployment, following a malfunction, etc.).

*The turbidity sensors of the HCMR are calibrated twice a year (6 month interval).*

1. Please provide a brief description of your calibration setup for the specified parameter/ measurand, including a list of the principal equipment, reference material (certified and/or conventionally accepted) and instrumentation involved in a typical calibration operation.

*-Special container*

*-Reference solutions of known concentration and size*

*- Measurement equipment (lab multi meter etc)*

 3. Do you employ reference material which are mutable or unstable

(e.g. biological cultures, optically-sensitive pigment extracts, etc.)

to calibrate the sensor/s or sensor system/s you are presently using for

the specified parameter/measurand. **No**

 4. In your view, does your facility ensure an effective traceability chain for the

specified parameter/measurand? **Yes**

 5. Please provide a brief description of the procedures employed to ensure adherence of the performances of the principal equipment and reference instrumentation of the calibration setup to factory specifications (in-house monitoring of performance, in loco re-calibration, servicing by the manufacturer, etc.).

*Polysterene particles of known size and density are used as reference solution to ensure the above.*

 6. Does your facility maintain a Manual with a description of the calibration method

and the measuring procedures, together with details of sample treatment and

preparation when these steps are present? **Yes**

7. In your view, is regular factory calibration/servicing necessary to obtain

optimal performances from your sensors/instrumentation for the

specified parameter/measurand in the field? **Yes**

(If **Yes**, please provide details of the sensors/instrumentation, indicating also the intervals you recommend for factory calibration/servicing, below)

*Apart from calibration issues a regular factory service (2 years interval) will assure the sensor proper function.*

 8. Do you perform field calibrations for the specified parameter/measurand? **Yes**

(If **Yes**, please provide a brief description of the method and procedures)

*The turbidity sensors of the HCMR are field validated and calibration corrections are applied if necessary.*

 9. Does your facility perform:

* internal quality audits to monitor and assess its

 calibration system for the specified parameter? **Yes** - independent quality audits to monitor and assess its

 calibration system for the specified parameter?  **No**

(If **Yes** to any of the above, please provide a brief description of the procedure/s applied, including a list of the principal equipment and instrumentation involved)

*The behaviour of the sensors, deployed in the field after the calibration, is monitored by monthly comparison against survey data and samples.*

10. Does your facility actively maintain an archive containing issued calibration

reports/certificates for the specified parameter/measurand? **Yes/No**

(If **Yes**, please specify the document retention time/s)

*The certificates are issued every six months and the retention time is 18 months.*

11. Do you have any suggestions or ideas for improving the quality of your

calibrations for any particular sensor/sensor system you are presently using

for the specified parameter/measurand (e.g. innovative reference material,

modifications to existing methodologies or new methodologies

you have developed, etc.)?

*Although our container is close to calibration specifications and gives us fairy low dark counts, a new one that is black coated with a diameter of at least 20 cm and a depth of at least 50 cm and with a matte finish coating to avoid wall effect in our calibration data, could give more reliable results.*

*A reference solution of Styrene Divinylbenzene Polymer Beads at a level of 10 NTU seem to be more convenient in use and lower the cost substancially.*

12. Do you have any suggestions or ideas for improving the general quality

of the calibration of sensors or instruments for measuring the specified

parameter/measurand (e.g. testing and promoting the use of new

reference material, development of new methodologies, etc.)?  **No**

Submitted on: 10/01/2012

 (Date)

Compiled by: Dimitris Podaras

 (Name of respondent)

**Task 4.1.3 Chemical Sensors**

(\* Please provide a separate sheet for each parameter)

Part b: Calibration

Parameter/measurand\*: Fluorescence / Chl\_a

Unit of measurement: ug/l

Range: *0.01-50 ug/l*

Accuracy: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Precision: *0.01 ug/l*

Calibration uncertainty (if available): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How often do you calibrate the sensor/s or sensor system/s you are presently using for the specified parameter/measurand: please list the typical calibration interval/s you are employing; note that if you are calibrating irregularly, kindly specify why and when (e.g. before a deployment, following a malfunction, etc.).

*The chl\_a sensors of the HCMR are calibrated twice a year (6 month interval).*

1. Please provide a brief description of the calibration setup, including a list of the principal equipment, reference material (certified and/or conventionally accepted) and instrumentation involved in a typical calibration operation.

*- Dark room*

*- Special container*

*- Reference solutions of known concentration and size*

*- Measurement equipment (lab multi meter etc)*

 3. Do you employ reference material which are mutable or unstable

(e.g. secondary standards, reagent & baseline solutions or blanks,

gas mixtures, etc.) to calibrate the sensor/s or sensor system/s

you are presently using for the specified parameter/measurand.  **Yes**

(if **Yes**, please list the types of this kind of reference material you are employing; kindly specify also the measures you take to guarantee the reliability of the reference material in terms of batch-to-batch uniformity of characteristics)

*Cultures of local species that are measured also through a Turner 10-AU-005 fluorometer that is calibrated on a regular bases to ensure the reliability of the reference material.*

 4. In your view, does your facility ensure an effective traceability chain for the

specified parameter/measurand? **Yes**

 5. Please provide a brief description of the procedures employed to ensure adherence of the performances of the principal equipment and reference instrumentation of the calibration setup to factory specifications (in-house monitoring of performance, in loco re-calibration, servicing by the manufacturer, etc.).

*The Turner 10-AU-005 fluorometer is calibrated once a year with a reference chlorophyll solution extracted by an algae of the species Anacystis nidulans that is diluted several times and measured each time through the fluorometer to receive the correction factor*

 6. Does your facility maintain a Manual with a description of the calibration method

and the measuring procedures, together with details of sample treatment and

preparation when these steps are present? **Yes**

 (If **Yes**, kindly attach a copy to the completed questionnaire, otherwise please provide a short, description below)

 7. In your view, is regular factory calibration/servicing necessary to obtain

optimal performances from your sensors/instrumentation for the

specified parameter/measurand in the field? **Yes**

*Although the calibration of the chl\_a sensors it is simple to perform the servicing of the sensors every couple of years (or more) should be done by the manufacturer.*

 8. Do you perform field calibrations for the specified parameter/measurand? **Yes**

(If **Yes**, please provide a brief description of the method and procedures).

*The chl\_a sensors of the HCMR are field validated and calibration corrections are applied if necessary.*

 9. Does your facility perform:

* internal quality audits to monitor and assess its

 calibration system for the specified parameter? **Yes** - independent quality audits to monitor and assess its

 calibration system for the specified parameter?  **No**

10. Does your facility actively maintain an archive containing issued calibration

reports/certificates for the specified parameter/measurand?  **No**

11. Do you have any suggestions or ideas for improving the quality of your

calibrations for any particular sensor/sensor system you are presently using

for the specified parameter/measurand (e.g. innovative reference material,

modifications to existing methodologies or new methodologies

you have developed, etc.)?

(if **Yes**, please provide a brief description of your ideas and/or suggestions, including the details of the sensor/s or sensor system/s)

*It seems that the chosen local species culture may affect the reliability of the measures, so it is suggested by Wetlabs the use of Uranine solution. Because of the low chlorophyll values in the eastern Mediterranean and small range compared with that of the sensors under calibration, a lower range and less solutions are suggested to calibrate the sensors*

12. Do you have any suggestions or ideas for improving the general quality

of the calibration of sensors or instruments for measuring the specified

parameter/measurand (e.g. testing and promoting the use of new

reference material, development of new methodologies, etc.)? **No**

Submitted on: 10/01/2012

 (Date)

Compiled by: Dimitris Podaras

 (Name of respondent)