Responsive Management

COASTAL COMMUNITY PROFESSIONALS' USE OF, SATISFACTION WITH, AND REQUIREMENTS FOR IN SITU CHLOROPHYLL FLUOROMETERS

Conducted for the Alliance for Coastal Technologies

by Responsive Management

2004

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EXECUTIVE SUMMARY

INTRODUCTION AND METHODOLOGY

This study was conducted for the Alliance for Coastal Technologies (ACT) to assess how various parties commonly use in situ chlorophyll fluorometers, their satisfaction with the capabilities of existing models, and their requirements for instrument performance. The study entailed a survey of 50 coastal community professionals knowledgeable about in situ chlorophyll fluorometers.

For the survey, telephone interviews were conducted. The telephone survey questionnaire was developed cooperatively by Responsive Management, the ACT, and knowledgeable professionals. Interviews were conducted Monday through Friday from 9:00 a.m. to 9:00 p.m., all local time. The survey was conducted in August and September of 2004. Responsive Management obtained a total of 50 completed interviews.

The software used for data collection was Questionnaire Programming Language 4.1. The analysis of data was performed using Statistical Package for the Social Sciences software as well as proprietary software developed by Responsive Management.

PRIMARY SENSOR DEPLOYMENT AREA OF INTEREST

- Research best represents a majority (90%) of respondents' primary sensor deployment area of interest or application concern, distantly followed by resource management (10%).

PRIMARY INVESTIGATION ENVIRONMENTS

- Coastal/near shore best represent a majority (62%) of respondents' primary investigation/monitoring environment, followed by intermediate depths of 10 to 100 meters (46%), blue water/marine (42%), depths of more than 100 meters (40%), and estuaries (40%).

USE OF IN SITU CHLOROPHYLL FLUOROMETERS

- A majority (86%) of respondents currently use in situ chlorophyll fluorometer sensors; 14% do not.

- Respondents' most common applications are using the sensor as part of a suite of instruments used for profiling (74%), deploying the sensor on remote platforms for continuous in situ monitoring (67%), and using a flow-through system on a vessel for periodic surveys (56%).

ABSOLUTE CHLOROPHYLL CONCENTRATIONS

- A majority (64%) of respondents use in situ chlorophyll fluorometers to determine both absolute concentrations and relative changes.
  - 28% use in situ chlorophyll fluorometers to determine relative changes only.
  - 8% use in situ chlorophyll fluorometers to determine absolute concentrations only.

LIMITATIONS OF IN SITU CHLOROPHYLL FLUOROMETERS

- Regarding the in situ chlorophyll fluorometers they currently use, respondents have most commonly found limitations with accuracy (23%).
  - Other common limitations, or areas for which in situ chlorophyll fluorometers failed to meet respondents' expectations, include calibration life (21%), reliability (21%), quality of documentation/product handbook (19%), range/detection limits (16%), and precision (14%).

IMPORTANCE OF CHARACTERISTICS WHEN USING IN SITU CHLOROPHYLL FLUOROMETERS

- A majority (82%) of respondents rated reliability as the most important characteristic when using in situ chlorophyll fluorometers in the field.

- Respondents most commonly (27%) rated automatic calibration as the least important characteristic when using in situ chlorophyll fluorometers in the field.

IMPORTANCE OF CHARACTERISTICS WHEN PURCHASING IN SITU CHLOROPHYLL FLUOROMETERS

- A majority (80%) of respondents rated reliability as the most important characteristic when purchasing in situ chlorophyll fluorometers.

- Respondents most commonly (28%) rated automatic calibration as the least important characteristic when purchasing in situ chlorophyll fluorometers.

COMPARISON OF IMPORTANCE OF CHARACTERISTICS WHEN USING AND WHEN PURCHASING IN SITU CHLOROPHYLL FLUOROMETERS

- A majority of respondents rated reliability as an important characteristic when using (82%) and when purchasing (80%) in situ chlorophyll fluorometers. When asked to rate reliability on a scale of 1 to 5, with 5 being very important, the mean of respondents' ratings of reliability was 4.8 when using fluorometers and 4.7 when purchasing fluorometers.

CUSTOM CHARACTERISTICS

- A majority (80%) of respondents' sensor requirements are standard; 16% of respondents' sensor requirements are custom, or "non-standard", characteristics.

ANTICIPATED PURCHASES OF IN SITU CHLOROPHYLL FLUOROMETERS

- A plurality (44%) of respondents plan to acquire new commercial sensors within the next 2 years; 26% do not plan to acquire new commercial sensors.

- A majority (82%) of respondents will consider using a different sensor type other than the one they are currently using to measure in situ chlorophyll; 18% will not consider using a different sensor type.

RECOMMENDATIONS TO IMPROVE CURRENT DESIGNS

- When asked for their recommendations to improve current designs, respondents most commonly reported the need to address poor accuracy and biofouling issues.

TABLE OF CONTENTS

INTRODUCTION AND METHODOLOGY

This study was conducted for the Alliance for Coastal Technologies (ACT) to assess how various parties commonly use in situ chlorophyll fluorometers, their satisfaction with the capabilities of existing models, and their requirements for instrument performance. Study results will enable the ACT to accurately assess user needs and to assist with the development of improved sensor technology for monitoring and studying coastal environments. The study entailed a survey of 50 professionals knowledgeable about in situ chlorophyll fluorometers. Specific aspects of the research methodology are discussed below.

A targeted sample of known or likely users of in situ chlorophyll fluorometers was used for this survey. The ACT provided Responsive Management with a named list of coastal community professionals who would be willing to participate in the study. To locate the names of additional coastal community professionals for the survey sample, Responsive Management researched relevant Web sites: university oceanography/marine biology departments, coastal conservation organizations, and research programs that use fluorometry measurements. A pre-notification was sent to prospective survey participants via email, which was first approved by the ACT, explaining the study and asking for their participation. A copy of the emailed letter is attached to this report as Appendix A.

For the survey, telephone interviews were conducted. A central polling site at the Responsive Management office allowed for rigorous quality control over the interviews and data collection. Responsive Management maintains its own in-house telephone interviewing facilities. These facilities are staffed by interviewers with experience conducting computer-assisted telephone interviews on the subject of environmental issues and natural resources. The telephone survey questionnaire was developed cooperatively by Responsive Management, the ACT, and knowledgeable professionals.

To ensure that the telephone survey data collected were of the highest quality, Responsive Management has interviewers who have been trained according to the standards established by the Council of American Survey Research Organizations. Methods of instruction included lecture and role-playing. The Survey Center Manager conducted project briefings with the

interviewers prior to the administration of the survey. Interviewers were instructed on type of study, study goals and objectives, handling of survey questions, interview length, termination points and qualifiers for participation, interviewer instructions within the survey instrument, reading of the survey instrument, skip patterns, and probing and clarifying techniques necessary for specific questions on the survey instrument. The telephone survey interviews were monitored without the interviewers' knowledge to evaluate performance. After the surveys were obtained by the interviewers, the Survey Center Manager and statisticians edited each completed survey to ensure clarity and completeness.

Interviews were conducted Monday through Friday from 9:00 a.m. to 9:00 p.m., all local time. Multiple calls to prospective survey participants from the target sample were made to provide an equal opportunity for all to participate. When a respondent could not be reached on the first call, subsequent calls were placed on different days of the week and at different times of the day. The survey was conducted in August and September of 2004. Responsive Management obtained a total of 50 completed interviews.

The software used for data collection was Questionnaire Programming Language 4.1 (QPL). The survey data were entered into the computer as each interview was being conducted, eliminating manual data entry after the completion of the survey and the concomitant data entry errors that may occur with manual data entry. The survey instrument was programmed so that QPL branched, coded, and substituted phrases in the survey based on previous responses to ensure the integrity and consistency of the data collection. The analysis of data was performed using Statistical Package for the Social Sciences software as well as proprietary software developed by Responsive Management.

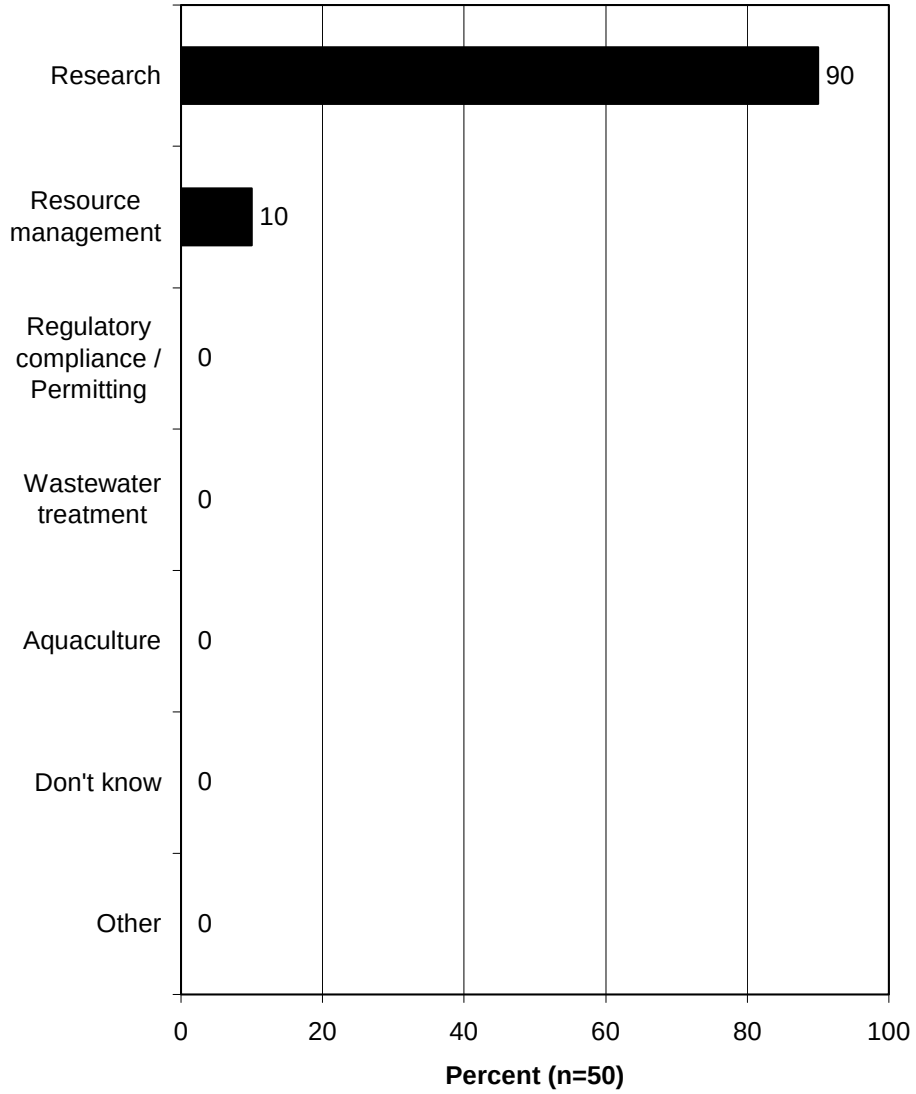
Note that some results may not sum to exactly 100% because of rounding.

SURVEY RESULTS

PRIMARY SENSOR DEPLOYMENT AREA OF INTEREST

- Research best represents a majority (90%) of respondents' primary sensor deployment area of interest or application concern, distantly followed by resource management (10%).

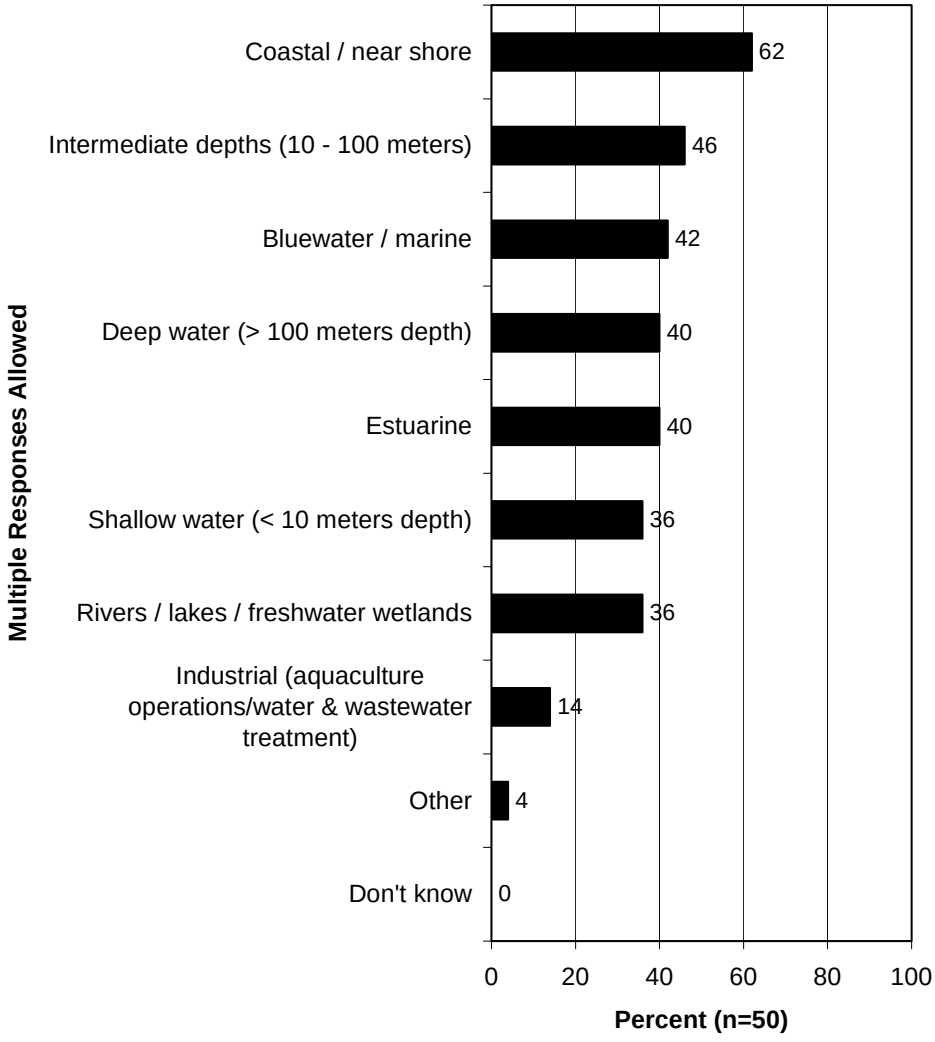
Q7. Which best represents your primary sensor deployment area of interest or application concern?



PRIMARY INVESTIGATION ENVIRONMENTS

- Coastal/near shore best represent a majority (62%) of respondents' primary investigation/monitoring environment, followed by intermediate depths of 10 to 100 meters (46%), blue water/marine (42%), depths of more than 100 meters (40%), and estuaries (40%).

Q10. Which represents your primary investigation/monitoring environments?



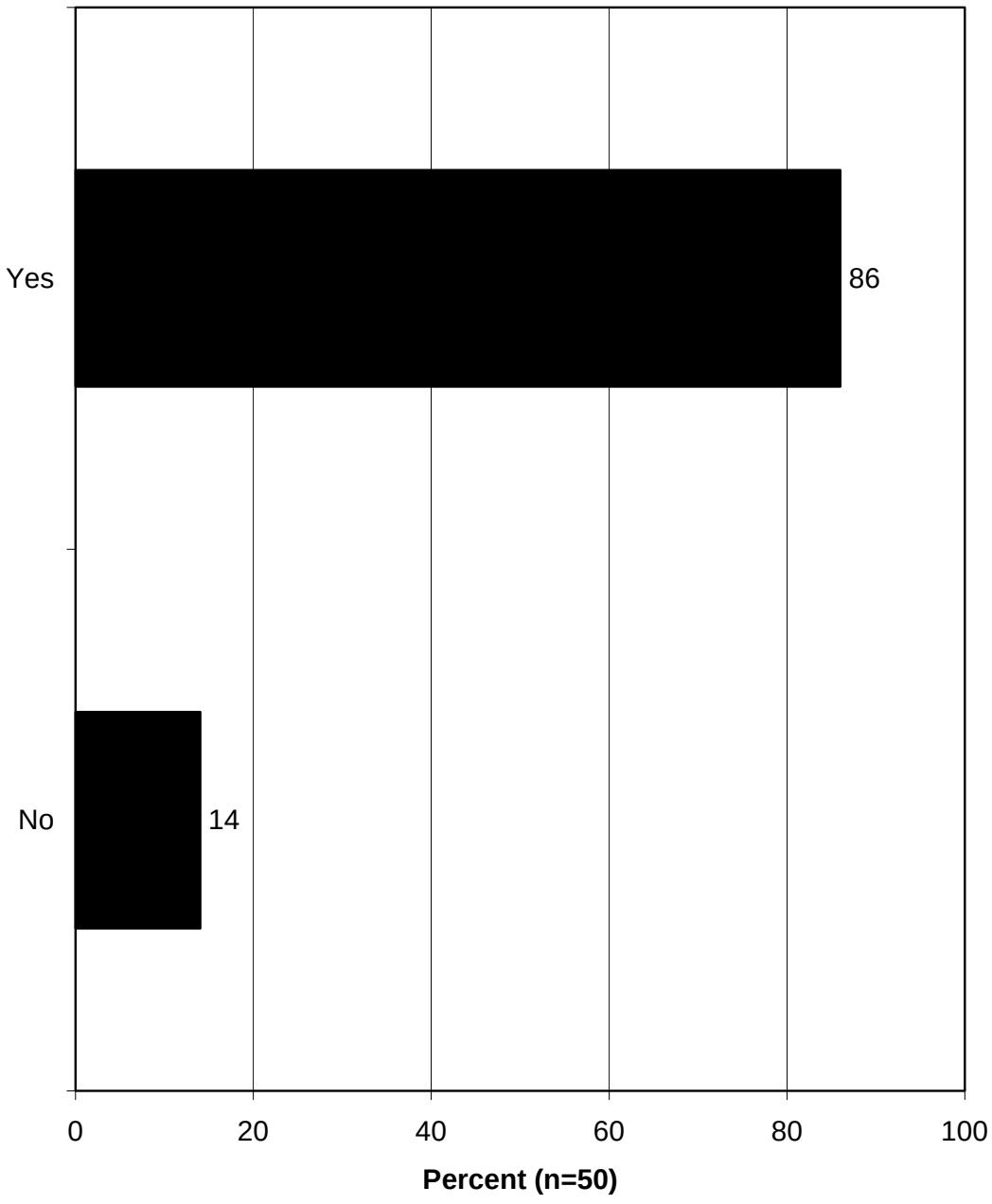
USE OF IN SITU CHLOROPHYLL FLUOROMETERS

- A majority (86%) of respondents currently use in situ chlorophyll fluorometer sensors; 14% do not.

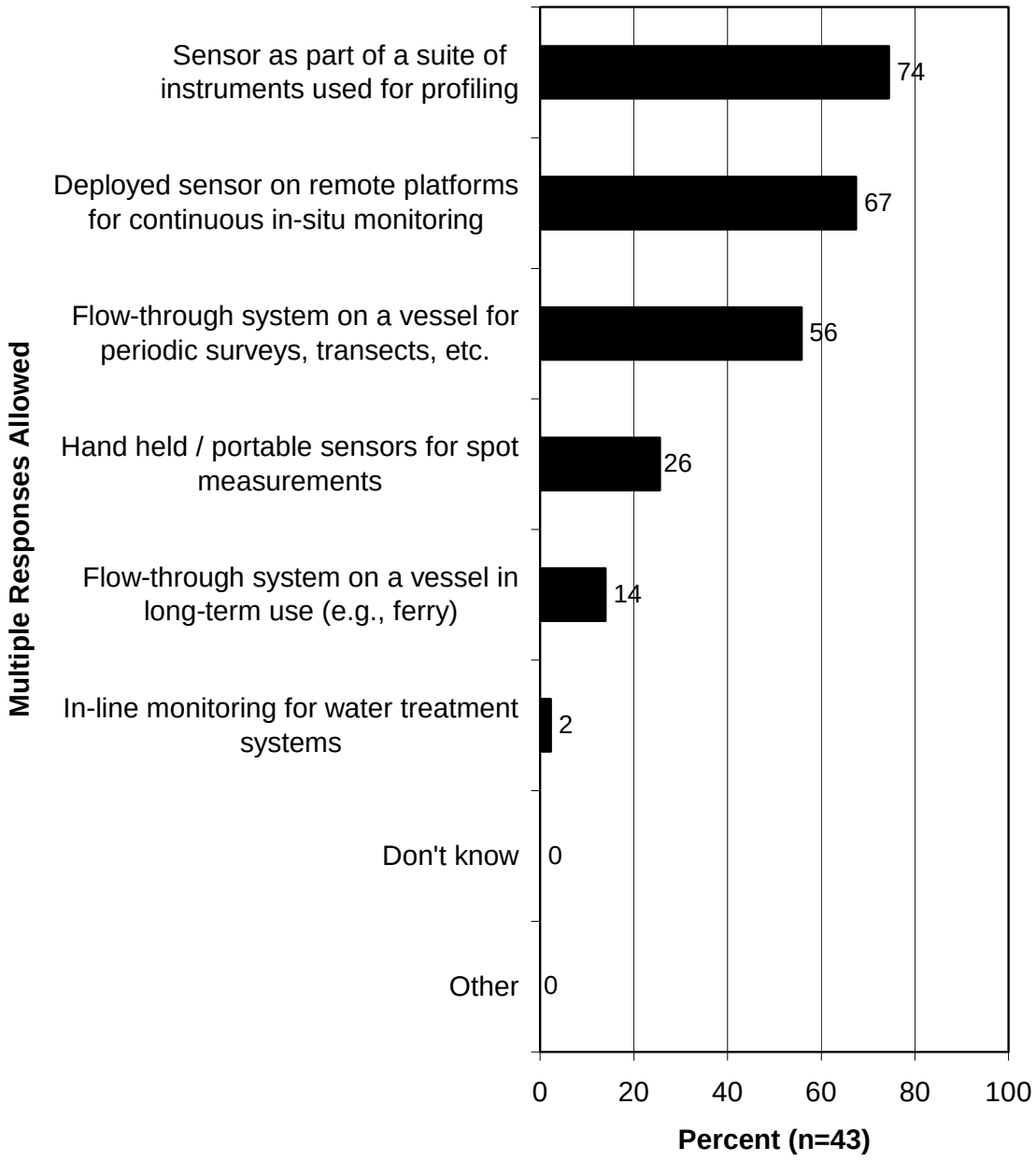
- Respondents' most common applications are using the sensor as part of a suite of instruments used for profiling (74%), deploying the sensor on remote platforms for continuous in situ monitoring (67%), and using a flow-through system on a vessel for periodic surveys (56%).

- A majority (98%) of respondents' current sensors are primarily commercial products; 2% of respondents' current sensors are a combination of commercial products and designs they developed.

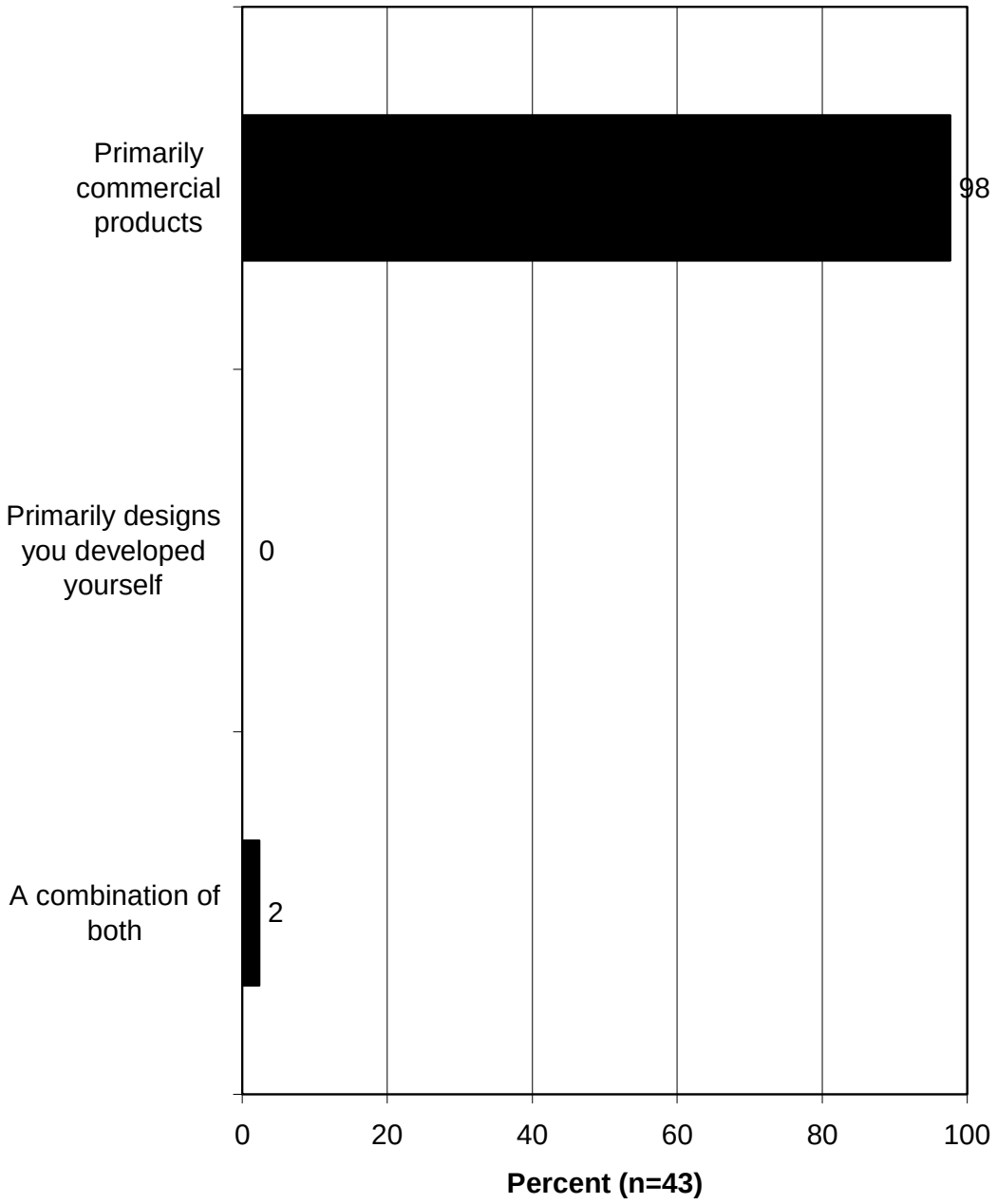
Q12. Do you currently use in situ chlorophyll fluorometer sensors?



Q14. What are your most common applications?



Q16. Are your current sensors...?

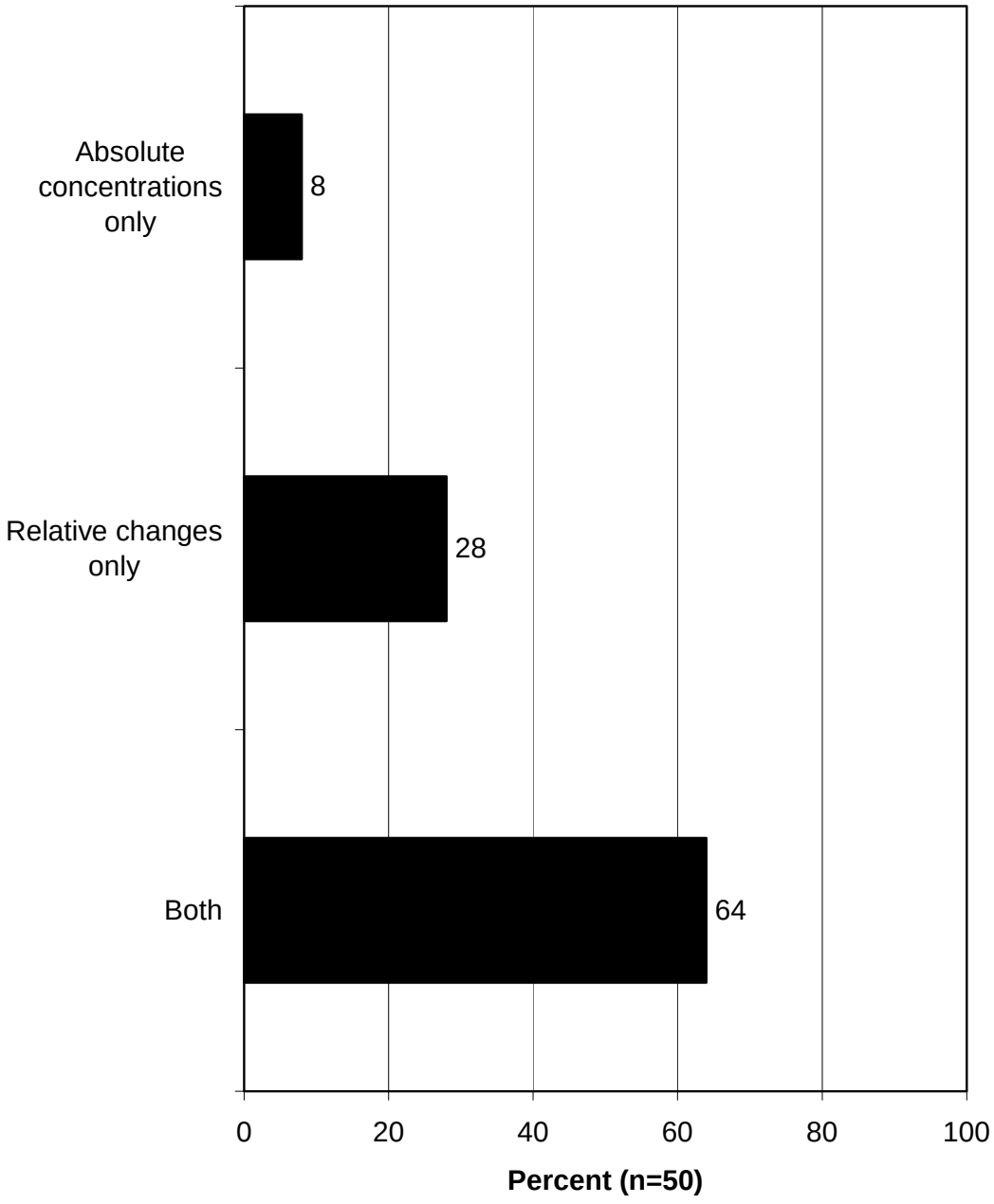


ABSOLUTE CHLOROPHYLL CONCENTRATIONS

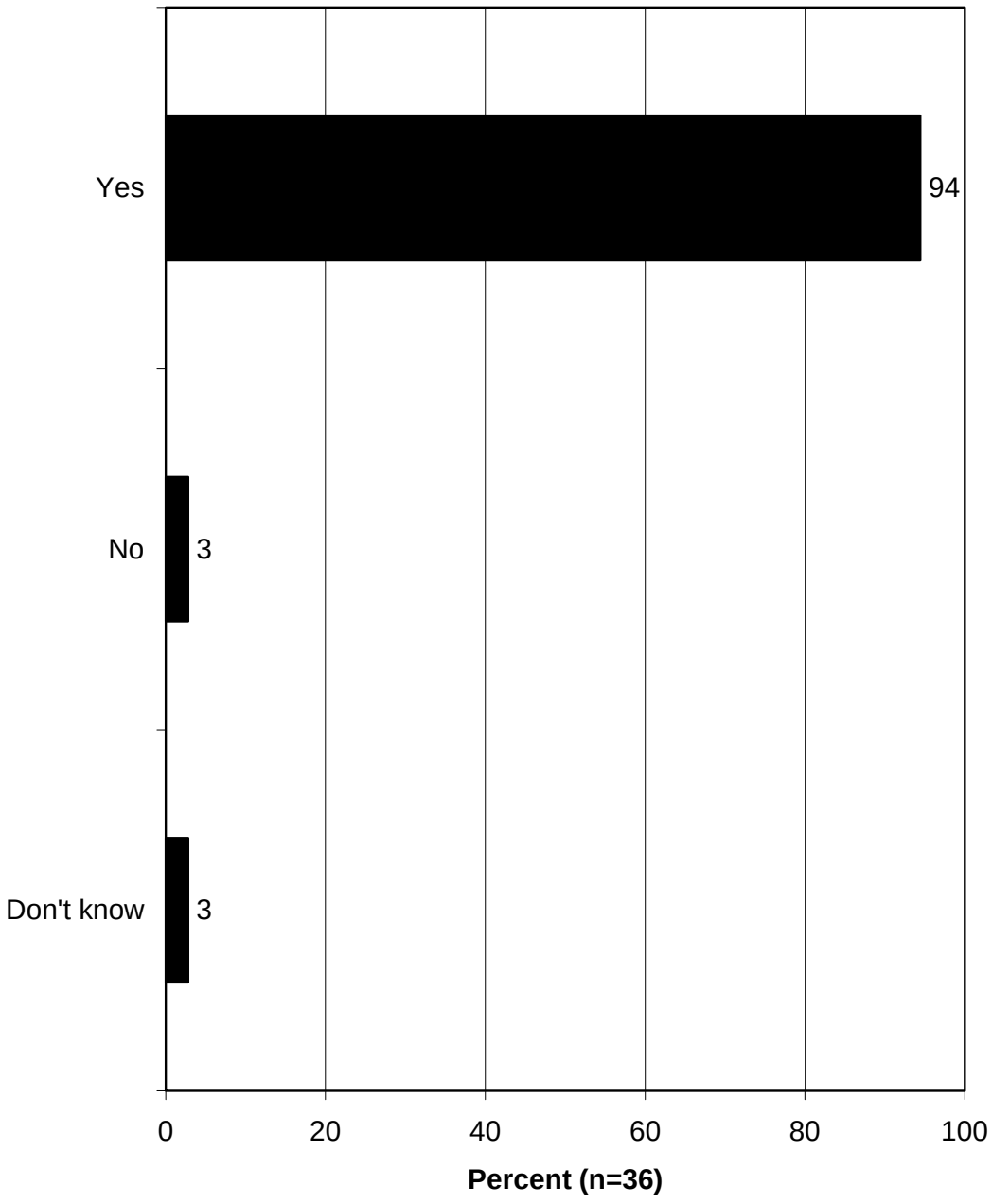
- A majority (64%) of respondents use in situ chlorophyll fluorometers to determine both absolute concentrations and relative changes.
  - 28% use in situ chlorophyll fluorometers to determine relative changes only.
  - 8% use in situ chlorophyll fluorometers to determine absolute concentrations only.

- A majority (94%) of respondents conduct their own absolute calibrations when using in situ chlorophyll fluorometers for determining absolute concentrations; 3% do not conduct their own absolute calibrations.
  - To calibrate the fluorometer for determining absolute concentrations, respondents reported using known standard solutions, extractions of chlorophyll, and available reference material.

Q80. Do you use your in situ chlorophyll fluorometer to determine absolute chlorophyll concentrations or only the relative changes?



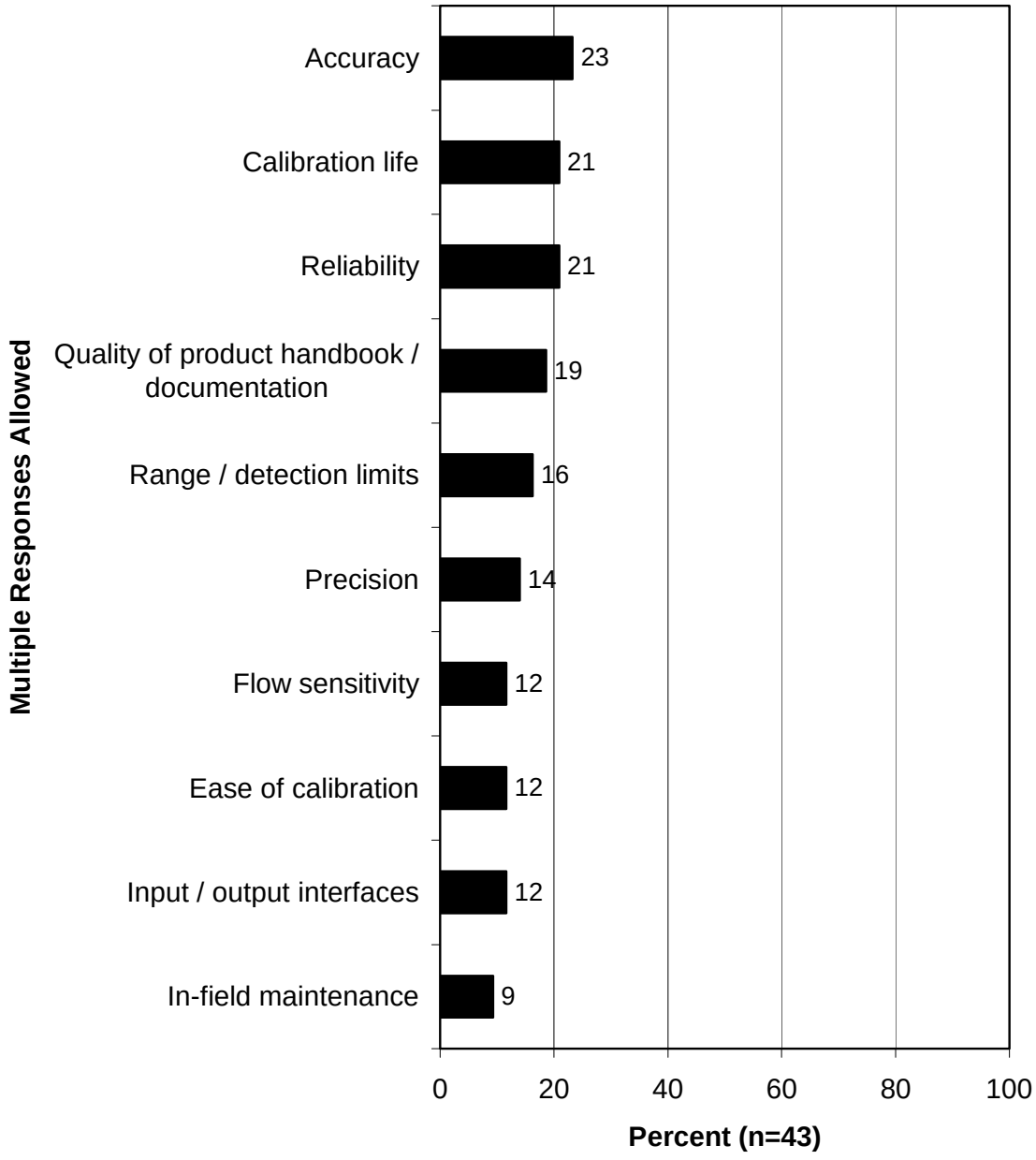
Q81. When determining absolute concentrations, do you conduct your own absolute calibrations?



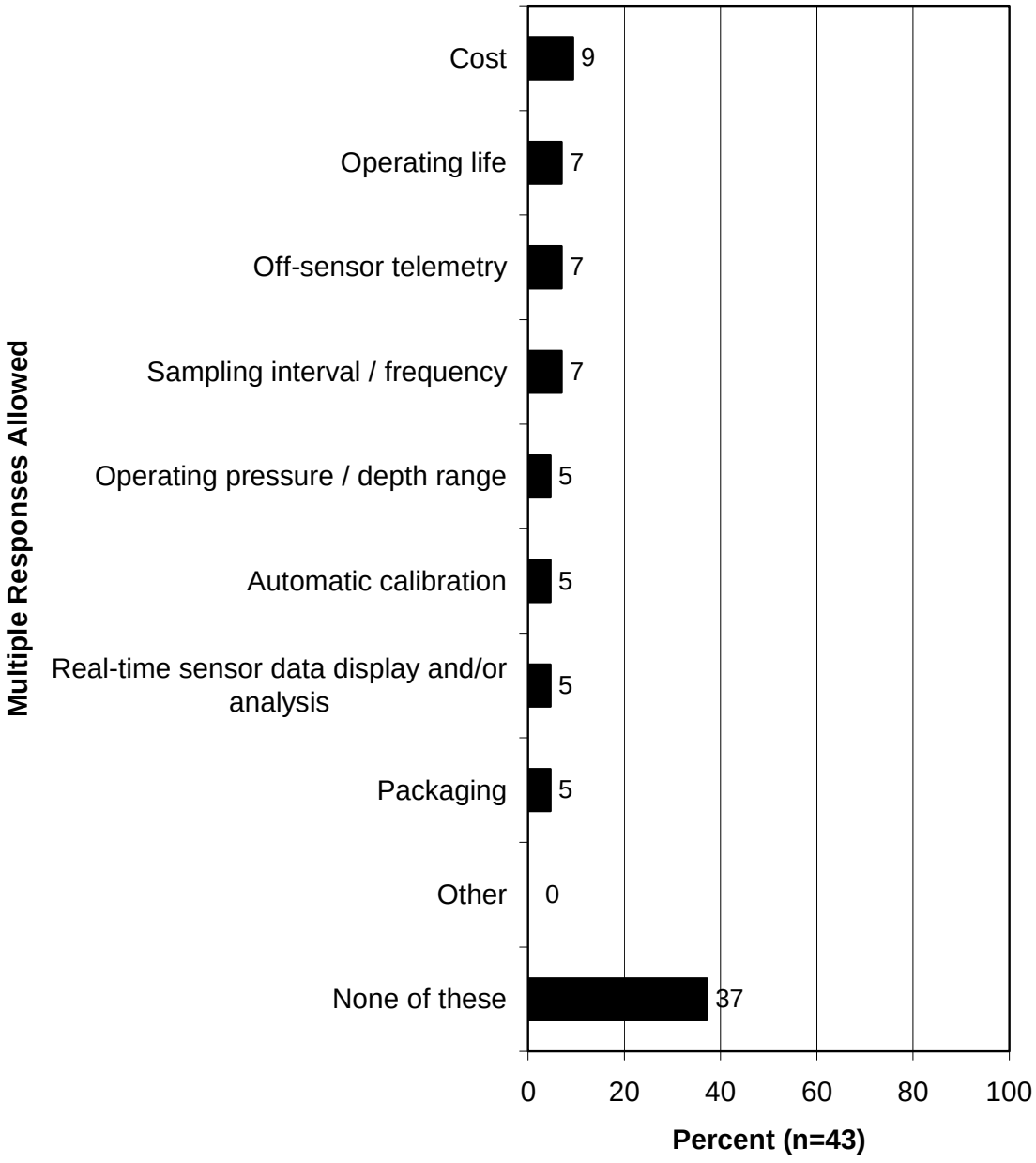
LIMITATIONS OF IN SITU CHLOROPHYLL FLUOROMETERS

- Regarding the in situ chlorophyll fluorometers they currently use, respondents have most commonly found limitations with accuracy (23%).
  - Other common limitations, or areas for which in situ chlorophyll fluorometers failed to meet respondents' expectations, include calibration life (21%), reliability (21%), quality of documentation/product handbook (19%), range/detection limits (16%), and precision (14%).

Q18, Q20. In which areas do the in situ chlorophyll fluorometers that you are currently using not meet your needs? Part 1.



Q18, Q20. In which areas do the in situ chlorophyll fluorometers that you are currently using not meet your needs? Part 2.



RANGE

- Of those who indicated limitations with range/detection, respondents most commonly reported poor sensitivity when monitoring blue water.

Comments regarding range are recorded below.

They (in situ chlorophyll fluorometers) cannot handle going from coastal lakes to blue water.
Low sensitivity is a problem. Blue water is not very good; they (in situ chlorophyll fluorometers) do not go low enough.
Sensitivity is a problem.
The values are low in some of the areas we work in.
Some parts of the year our data matches up; sometimes it does not.
Unreliable data is a problem.

ACCURACY

- Of those who indicated limitations with accuracy, respondents most commonly reported problems with biofouling issues.

Comments regarding accuracy are recorded below.

We do not know what the real values are because of unreliable data.
No accuracy is a problem.
Biofouling issues are a problem.
Biofouling is a problem.
They (manufacturers) should be able to make a more accurate.
Accuracy is inherent in measurement.

PRECISION

- Of those who indicated limitations with precision, one respondent reported problems with scattering interferences.

Comments regarding precision are recorded below.

Precision is inherent in measurement.
They (in situ chlorophyll fluorometers) are sometimes noisy.
I have trouble with scattering interferences.

FREQUENCY

- Of those who indicated limitations with frequency/sampling interval, respondents most commonly reported problems with a slow response time.

Comments regarding frequency are recorded below.

I would like them (in situ chlorophyll fluorometers) to go faster.

RELIABILITY

- Of those who indicated limitations with reliability, respondents most commonly reported problems with shutters failing, biofouling issues, and unstable instruments.

Comments regarding reliability are recorded below.

The copper shutter has failed quite often.
Biofouling issues are a problem.
(The in situ chlorophyll fluorometer) is less sensitive to dirty windows.
(The in situ chlorophyll fluorometer) has occasional unexplained spikes in the data that could be genuine or just occasional failures.
Our in situ chlorophyll fluorometers have shutters that need to be replaced every time. Anything motorized is usually the fail point.
In situ chlorophyll fluorometers are not stable enough and drift with time.
We have two of the same model. One model is marvelous, but the other model is horrible. I know it has something to do with the electronics of the sensor.
We had a few fail, some flood, and others that just did not work.

OPERATING LIFE

- Of those who indicated limitations with operating life, one respondent reported problems with bulbs wearing out too quickly and the degradation of the instrument's signal over time.

Comments regarding operating life are recorded below.

Battery drain, power consumption, and degradation of the signal over time.
Bulbs wear out; longer lasting bulbs would be good.
We have had a lot of problems with instruments that stop working.

OPERATING PRESSURE

- Of those who indicated limitations with operating pressure/depth range, respondents most commonly reported problems with depths greater than 500 meters.

Comments regarding operating pressure are recorded below.

Most (in situ chlorophyll fluorometers) will only go to 500 meters.
Plastic deforms at depths greater than 500 meters.

FLOW SENSITIVITY

- Of those who indicated limitations with flow sensitivity, one respondent reported problems with bubbles causing interference.

Comments regarding flow sensitivity are recorded below.

Bubbles are an interference.
We have noticed problems in lab calibrations.

CALIBRATION LIFE

- Of those who indicated limitations with calibration life, respondents most commonly reported problems with biofouling issues.

Comments regarding calibration life are recorded below.

Biofouling is probably the problem, not the sensor itself.
Calibration only lasts as long as the biofouling.
Biofouling issues are a problem, as well as difficulty in finding a solid calibration standard.
Biofouling is always a problem with fluorometers.
Instruments that drift and biofouling are problematic.
I must recalibrate too often.
Temperature sensitivity is a problem.
I would like the instrument to last longer.

AUTOMATIC CALIBRATION

- Of those who indicated limitations with automatic calibration, one respondent reported difficulty calibrating the instrument to standards.

Comments regarding automatic calibration are recorded below.

I have difficulty getting the instrument to calibrate to standards.
Automatic calibration would be nice to have.

EASE OF CALIBRATION

- Of those who indicated limitations with the ease of calibrations, respondents most commonly reported that calibration was difficult.

Comments regarding ease of calibration are recorded below.

There is not a good standardized method to calibrate.
Calibration is hard to do.
I have to get someone else to do the calibration.

REAL-TIME SENSOR DATA

- Of those who indicated limitations with real-time sensor data, one respondent reported problems with awkward user interfaces.

Comments regarding real-time sensor data are recorded below.

Clumsy user interfaces is a problem.
Hard to tell if it is working properly without connecting it to a computer.

OFF-SENSOR TELEMETRY

- Few respondents reported problems with off-sensor telemetry.

Comments regarding off-sensor telemetry are recorded below.

I am interested in using off-sensor telemetry.
Manufacturers have different ways to send formats.

INPUT/OUTPUT INTERFACES

- Few respondents reported problems with input/output interfaces.

Comments regarding input/output interfaces are recorded below.

It is nice to have a USB port on them as well.
Everybody should go to USB.

PACKAGING

- Of those who indicated limitations with packaging, one respondent reported that current designs are too big.

Comments regarding packaging are recorded below.

Some designs are better than others.
They are too big.

IN-FIELD MAINTENANCE

- Of those who indicated limitations with in-field maintenance, respondents most commonly reported being unable to monitor biofouling as a problem.

Comments regarding in-field maintenance are recorded below.

I need some way to monitor biofouling. We do not know the sensor fouled until we get it back or after biofouling has occurred.
We do not perform maintenance in the field; we have to bring it all back.

QUALITY OF DOCUMENTATION

- Of those who indicated limitations with the quality of documentation/product handbook, respondents most commonly reported the need for clarity and details. One respondent reported the need for an explanation of field repairs in the product handbook, and another respondent suggested including a section on limitations and expectations.

Comments regarding quality of documentation are recorded below.

Documentation can always be more layman-related.
Documentation has been really good, but more thought and work should be devoted to the manuals regarding field repairs.
I need more detail on circuit design and calibration procedures.
I need more documentation and labels for parts.
Most handbooks are too complex.
Handbooks are usually out-of-date and missing details. A section on limitations and expectations should be in the book.

COST

- Of those who indicated limitations with cost, respondents most commonly reported that the instruments were too expensive.

Comments regarding cost are recorded below.

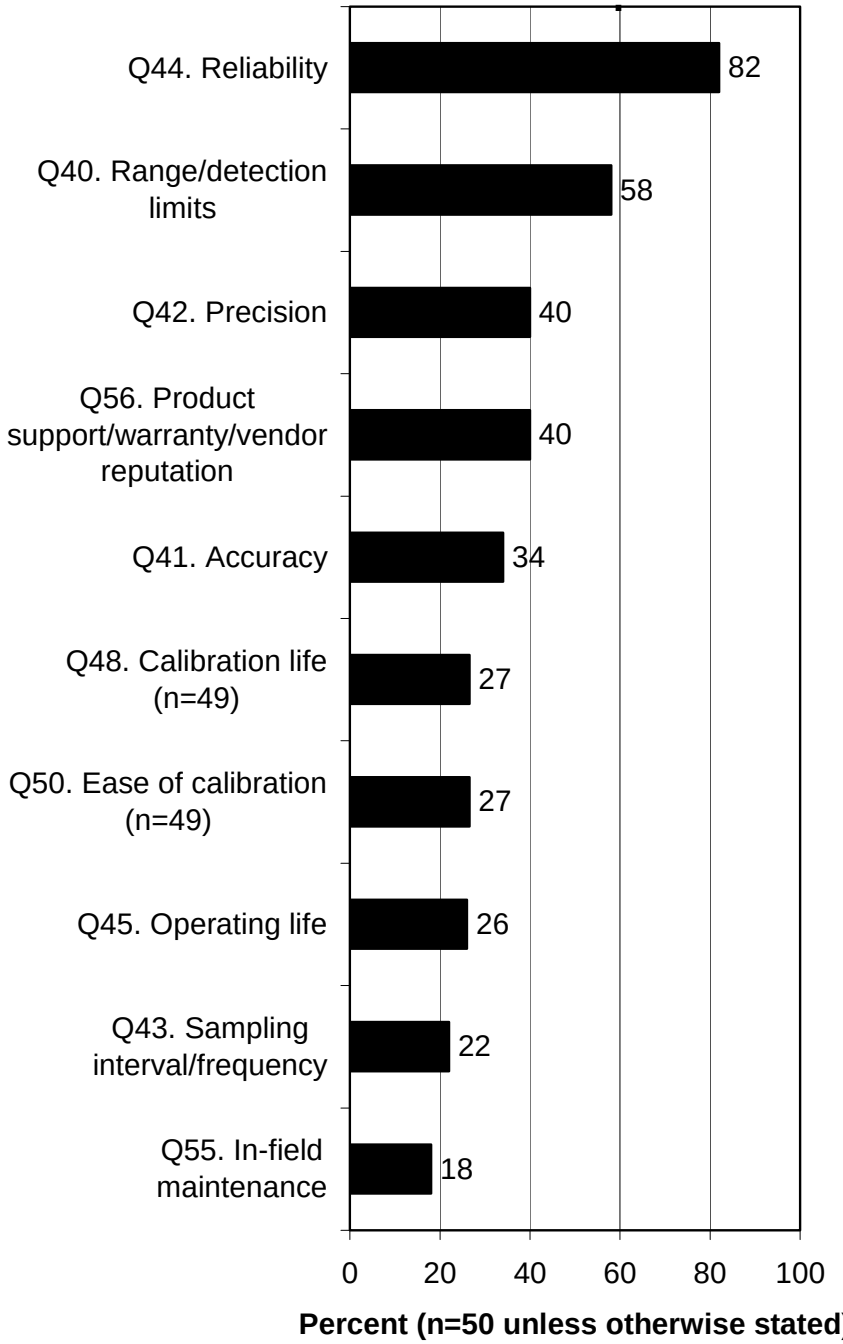
(In situ chlorophyll fluorometers) are just too pricey.
They (in situ chlorophyll fluorometers) are all too high.
(In situ chlorophyll fluorometers) are very expensive. You get what you pay for, but it is difficult on a state budget.

IMPORTANCE OF CHARACTERISTICS WHEN USING IN SITU CHLOROPHYLL FLUOROMETERS

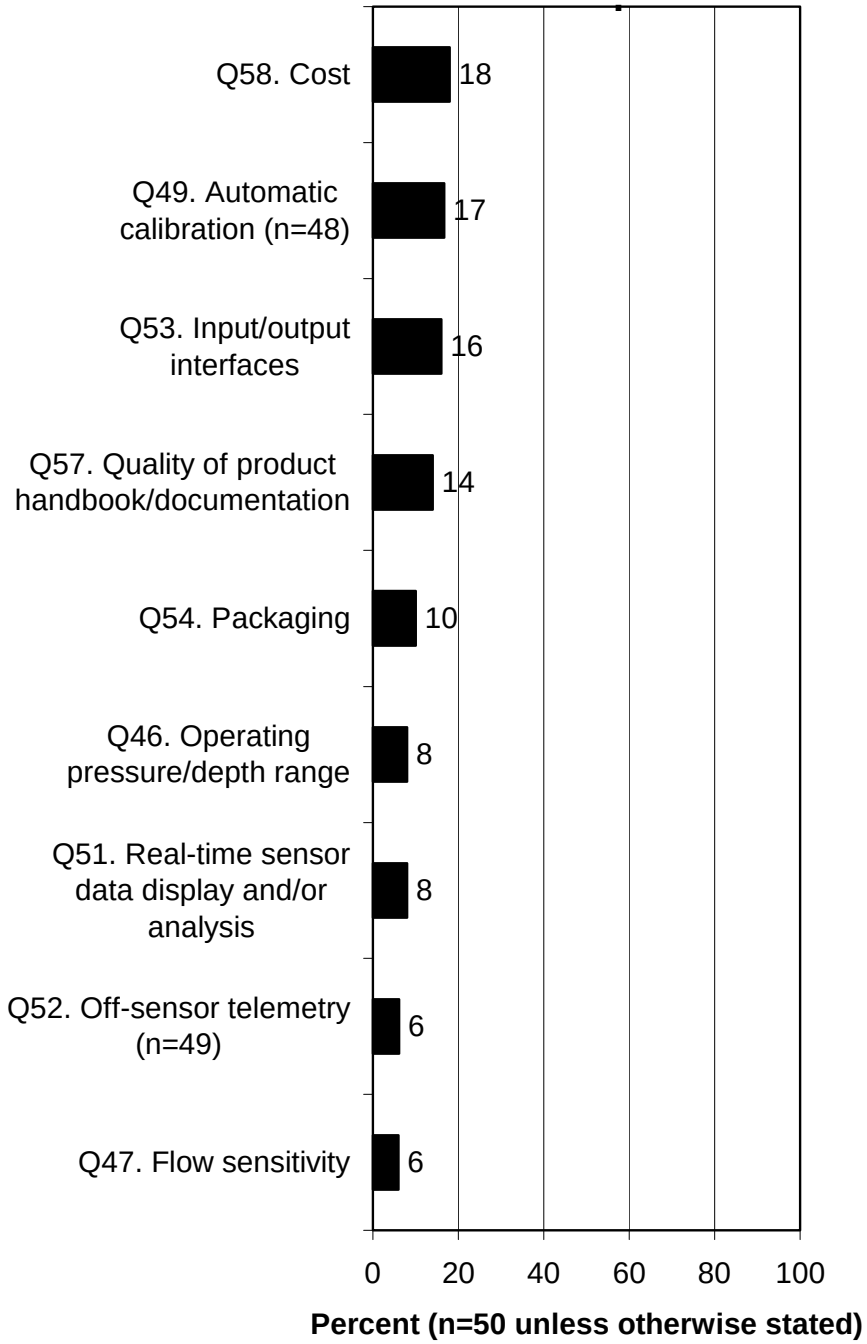
- Respondents were asked to rate characteristics on a scale of 1 to 5, with 1 being not at all important and 5 being very important. A majority (82%) of respondents rated reliability as the most important characteristic when using in situ chlorophyll fluorometers in the field.
  - Other characteristics rated as most important when using in situ chlorophyll fluorometers include range/detection limits (58%), precision (40%), product support/warranty/vendor reputation (40%), accuracy (34%), calibration life (27%), and ease of calibration (27%).

- Respondents most commonly (27%) rated automatic calibration as the least important characteristic when using in situ chlorophyll fluorometers in the field.
  - Other characteristics rated as least important when using in situ chlorophyll fluorometers include flow sensitivity (24%), off-sensor telemetry (16%), and operating pressure/depth range (16%).

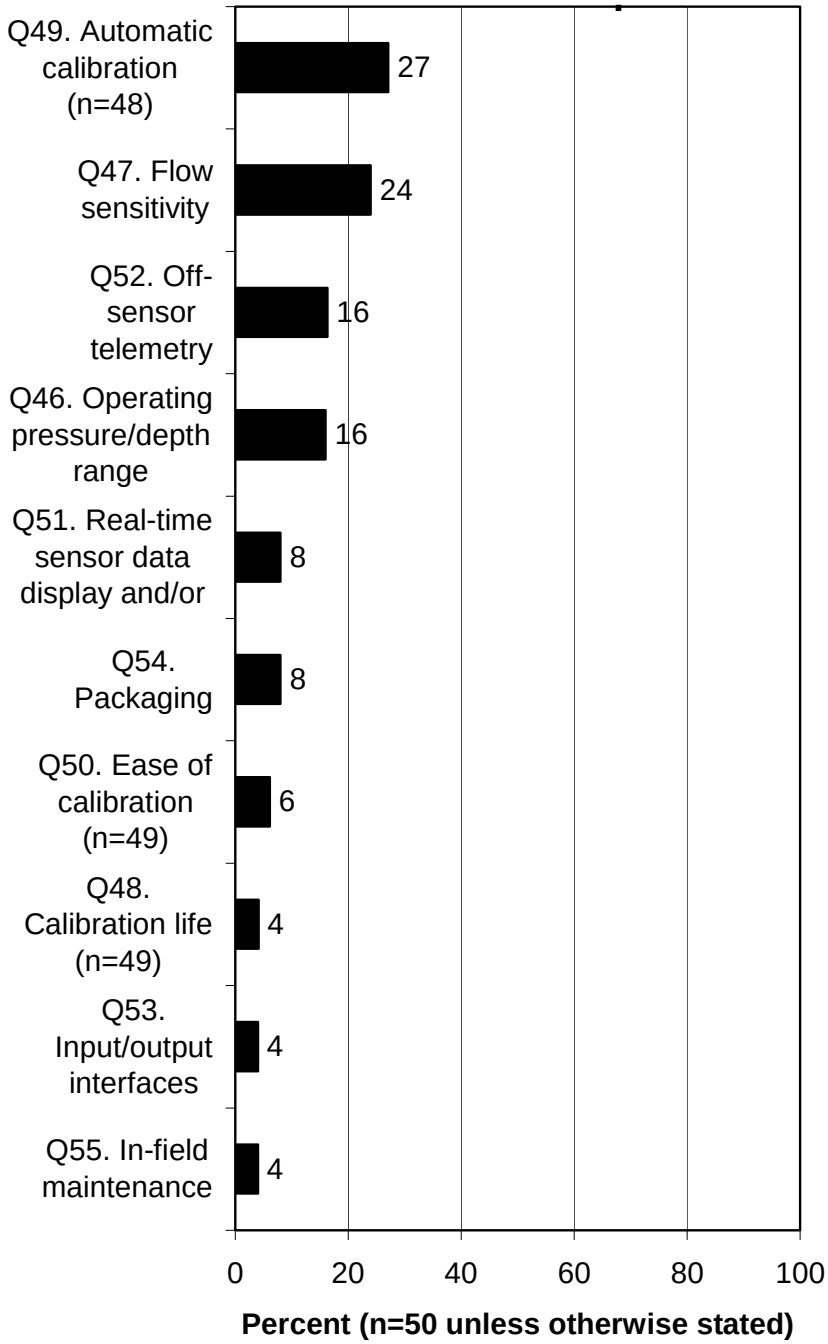
Q40-Q58. Percent who rated the following as a 5 in importance when using chlorophyll fluorometers in the field. Part 1.



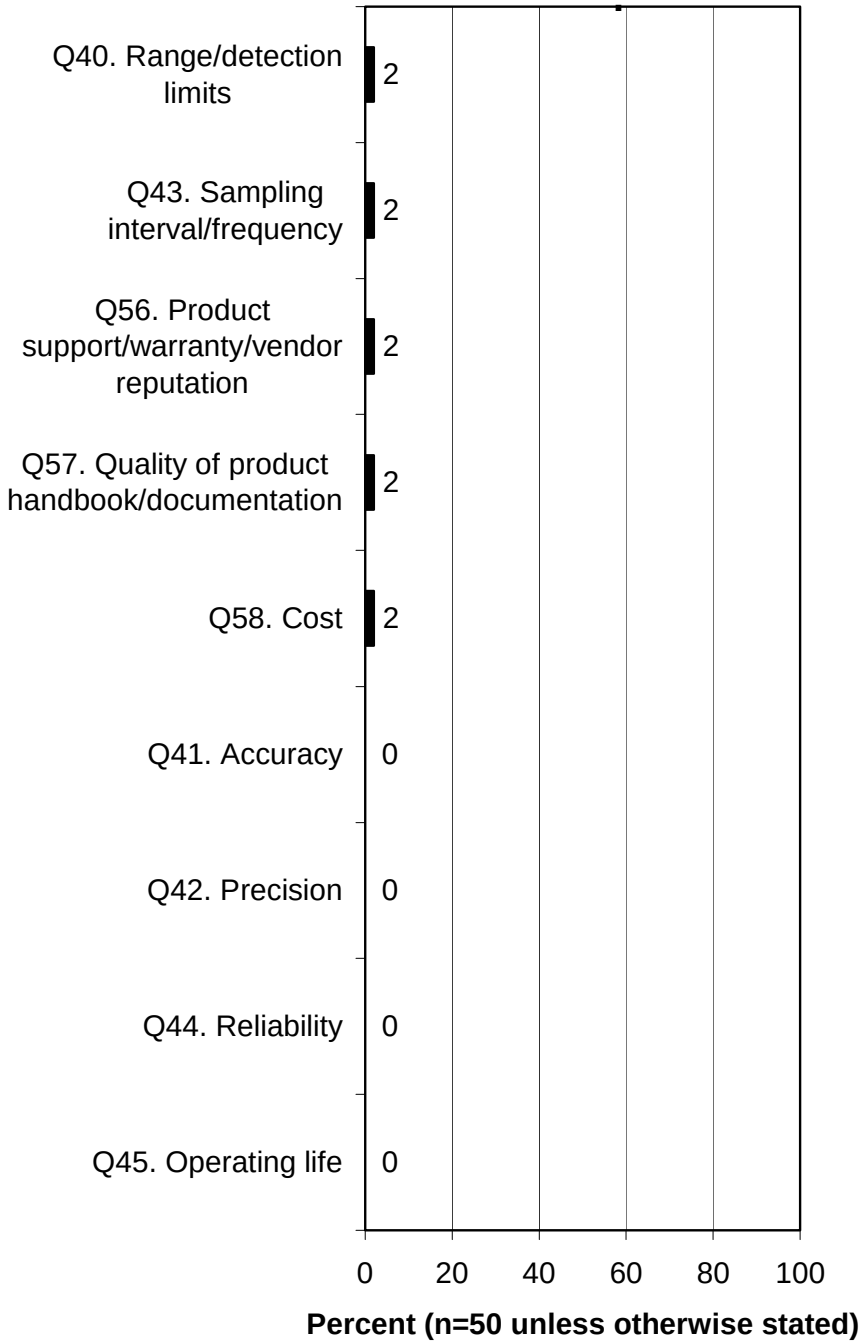
Q40-Q58. Percent who rated the following as a 5 in importance when using chlorophyll fluorometers in the field. Part 2.



Q40-Q58. Percent who rated the following as a 1 in importance when using chlorophyll fluorometers in the field. Part 1.



Q40-Q58. Percent who rated the following as a 1 in importance when using chlorophyll fluorometers in the field. Part 2.

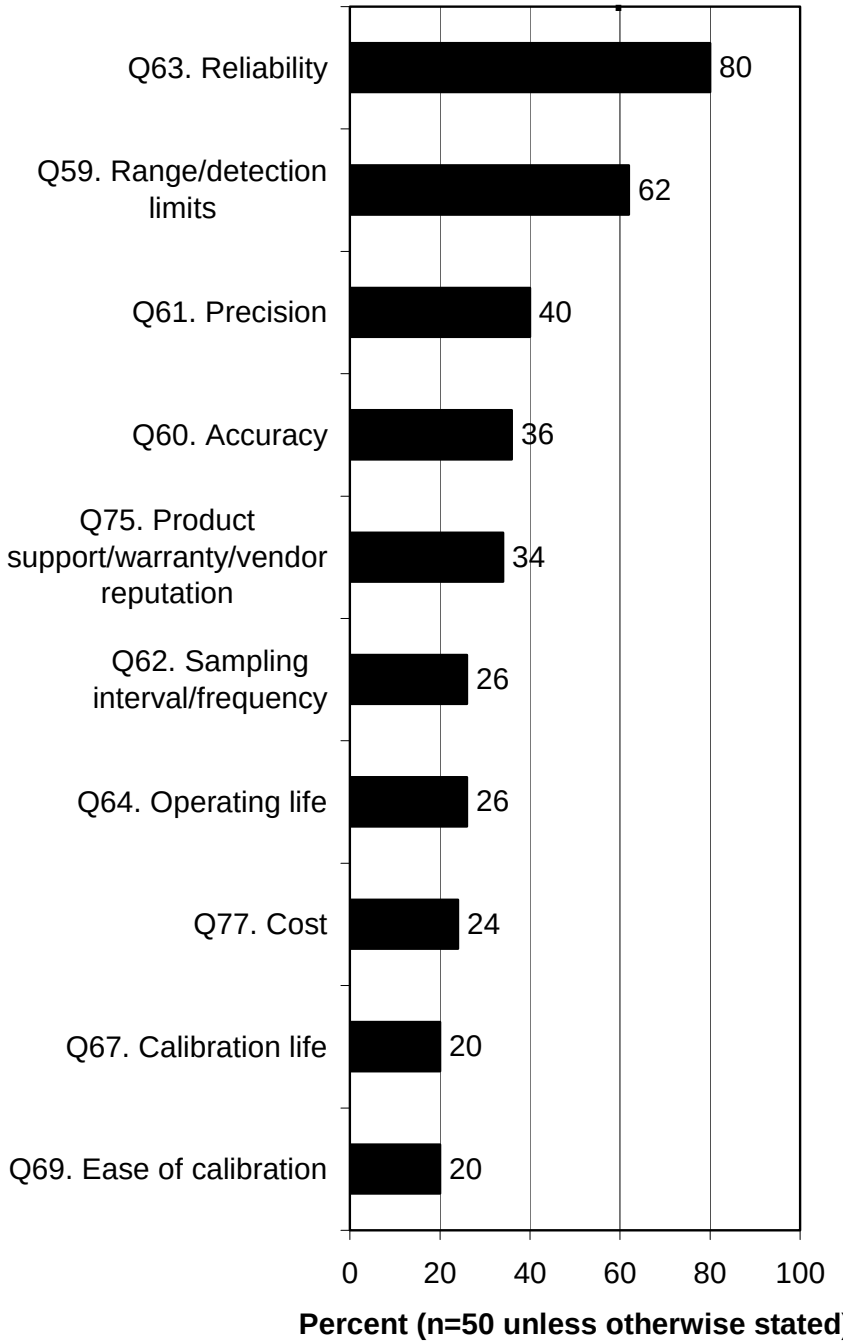


IMPORTANCE OF CHARACTERISTICS WHEN PURCHASING IN SITU CHLOROPHYLL FLUOROMETERS

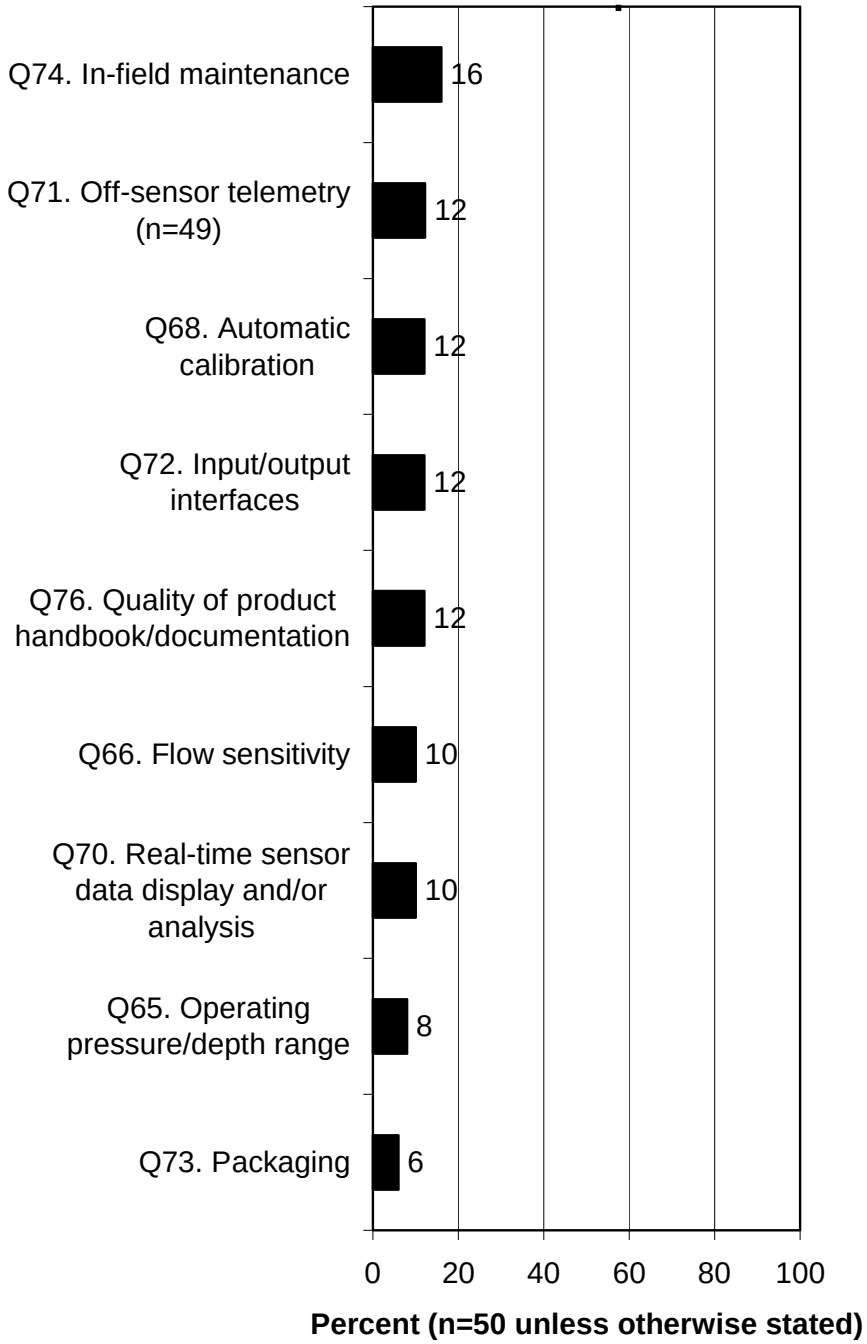
- Respondents were asked to rate characteristics on a scale of 1 to 5, with 1 being not at all important and 5 being very important. A majority (80%) of respondents rated reliability as the most important characteristic when purchasing in situ chlorophyll fluorometers.
  - Other characteristics rated as most important when purchasing in situ chlorophyll fluorometers include range/detection limits (62%), precision (40%), accuracy (36%), product support/warranty/vendor reputation (34%), sampling interval/frequency (26%), and operating life (26%).

- Respondents most commonly (28%) rated automatic calibration as the least important characteristic when purchasing in situ chlorophyll fluorometers.
  - Other characteristics rated as least important when purchasing in situ chlorophyll fluorometers include flow sensitivity (24%), off-sensor telemetry (20%), and operating pressure/depth range (16%).

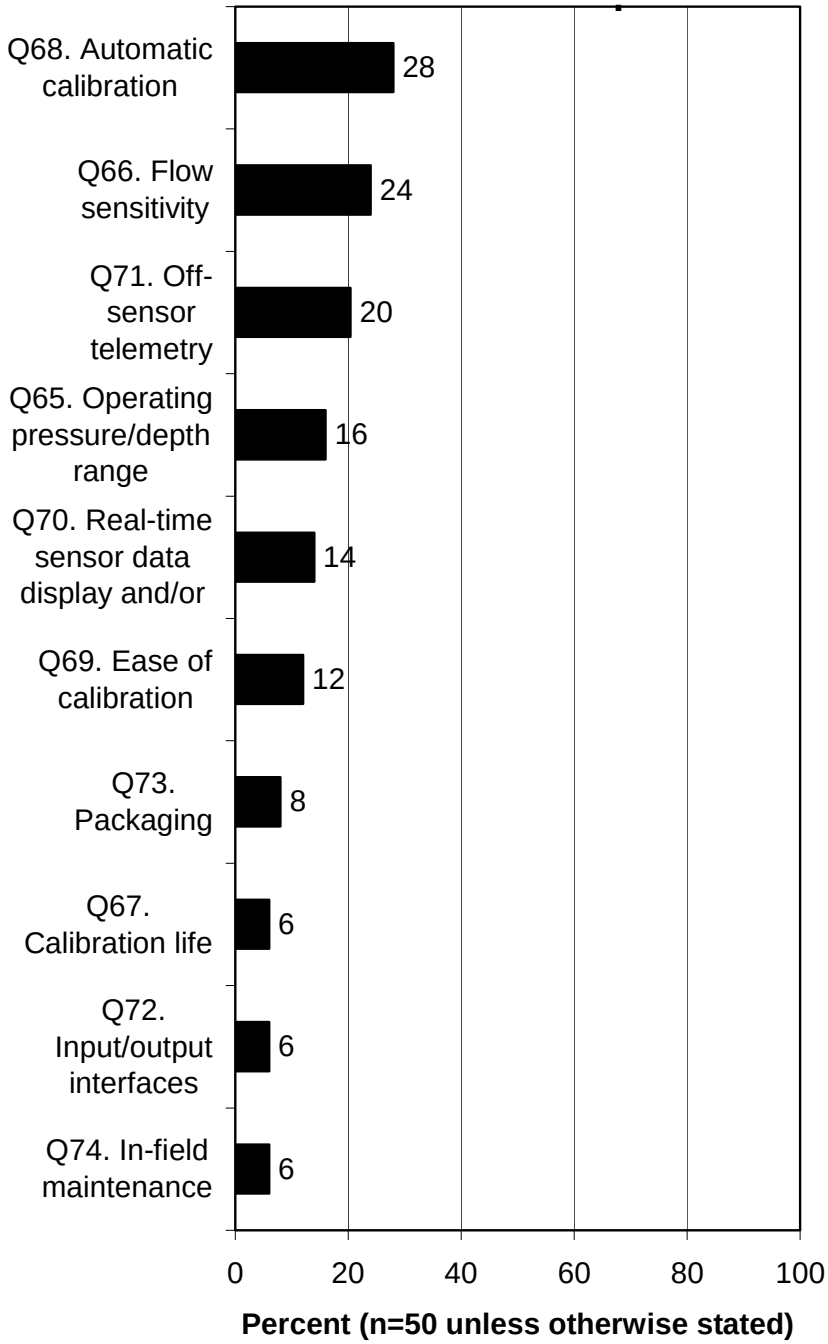
Q59-Q77. Percent who rated the following as a 5 in importance when deciding which chlorophyll fluorometer(s) to purchase. Part 1.



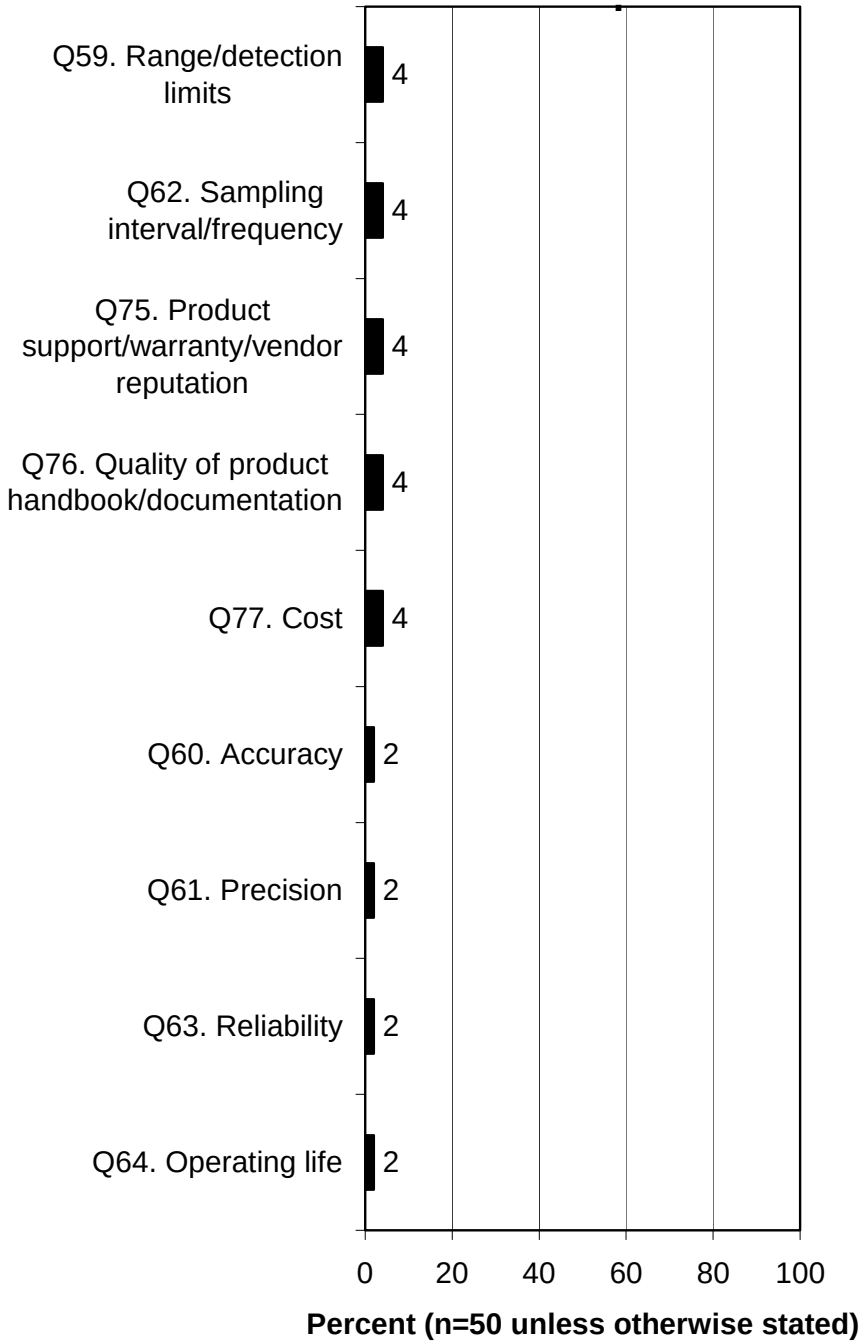
Q59-Q77. Percent who rated the following as a 5 in importance when deciding which chlorophyll fluorometer(s) to purchase. Part 2.



Q59-Q77. Percent who rated the following as a 1 in importance when deciding which chlorophyll fluorometer(s) to purchase. Part 1.



Q59-Q77. Percent who rated the following as a 1 in importance when deciding which chlorophyll fluorometer(s) to purchase. Part 2.



COMPARISON OF IMPORTANCE OF CHARACTERISTICS WHEN USING AND WHEN PURCHASING IN SITU CHLOROPHYLL FLUOROMETERS

- A majority of respondents rated reliability as an important characteristic when using (82%) and when purchasing (80%) in situ chlorophyll fluorometers. When asked to rate reliability on a scale of 1 to 5, with 5 being very important, the mean of respondents' ratings of reliability was 4.8 when using fluorometers and 4.7 when purchasing fluorometers.

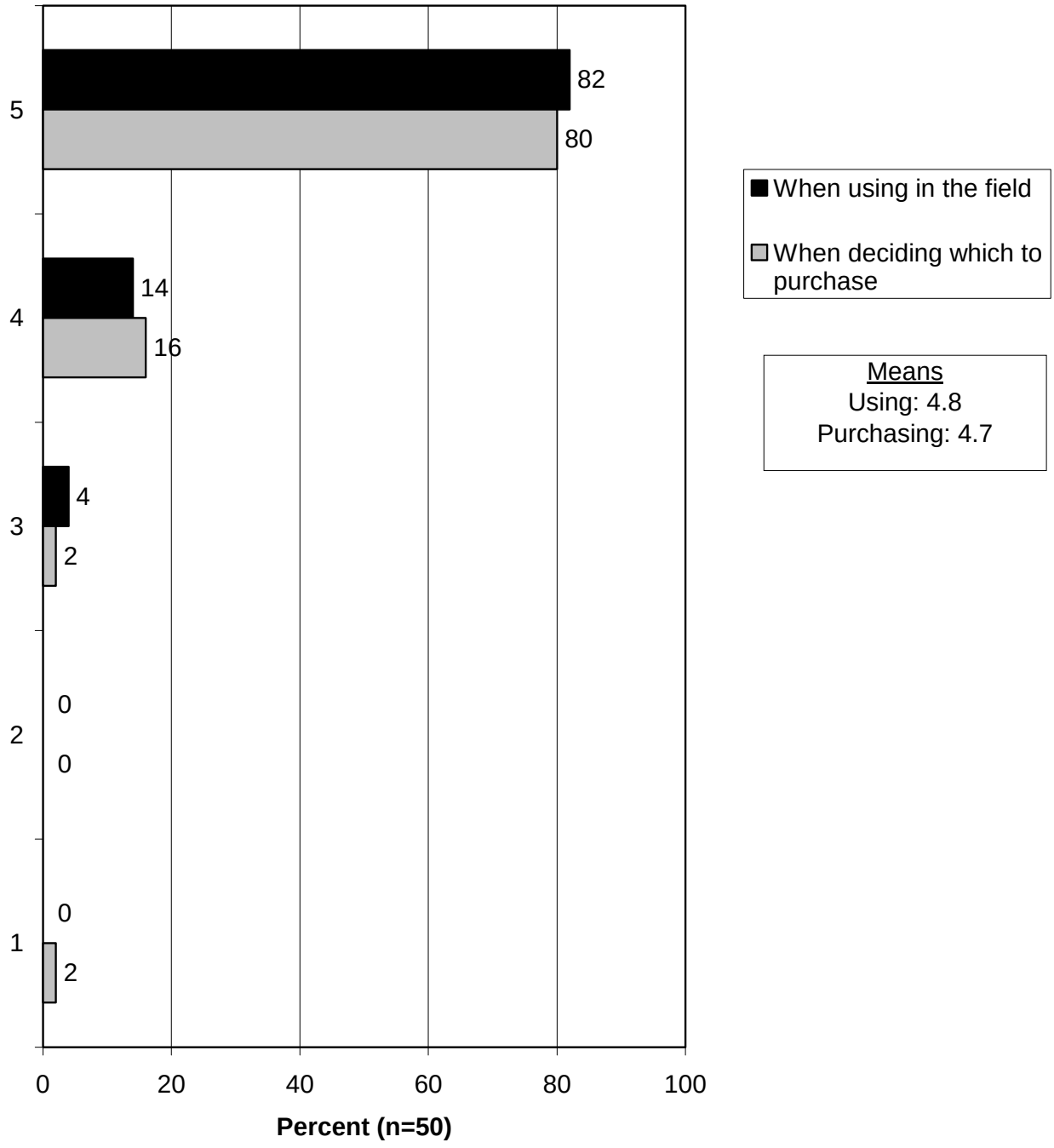
- A majority of respondents rated range/detection limits as an important characteristic when using (58%) and when purchasing (62%) in situ chlorophyll fluorometers. When asked to rate range/detection limits on a scale of 1 to 5, with 5 being very important, the mean of respondents' ratings of range/detection limits was 4.4 when using fluorometers and 4.4 when purchasing fluorometers.

- Respondents commonly rated precision as an important characteristic when using (40%) and when purchasing (40%) in situ chlorophyll fluorometers. When asked to rate precision on a scale of 1 to 5, with 5 being very important, the mean of respondents' ratings of precision was 4.1 when using fluorometers and 4.1 when purchasing fluorometers.

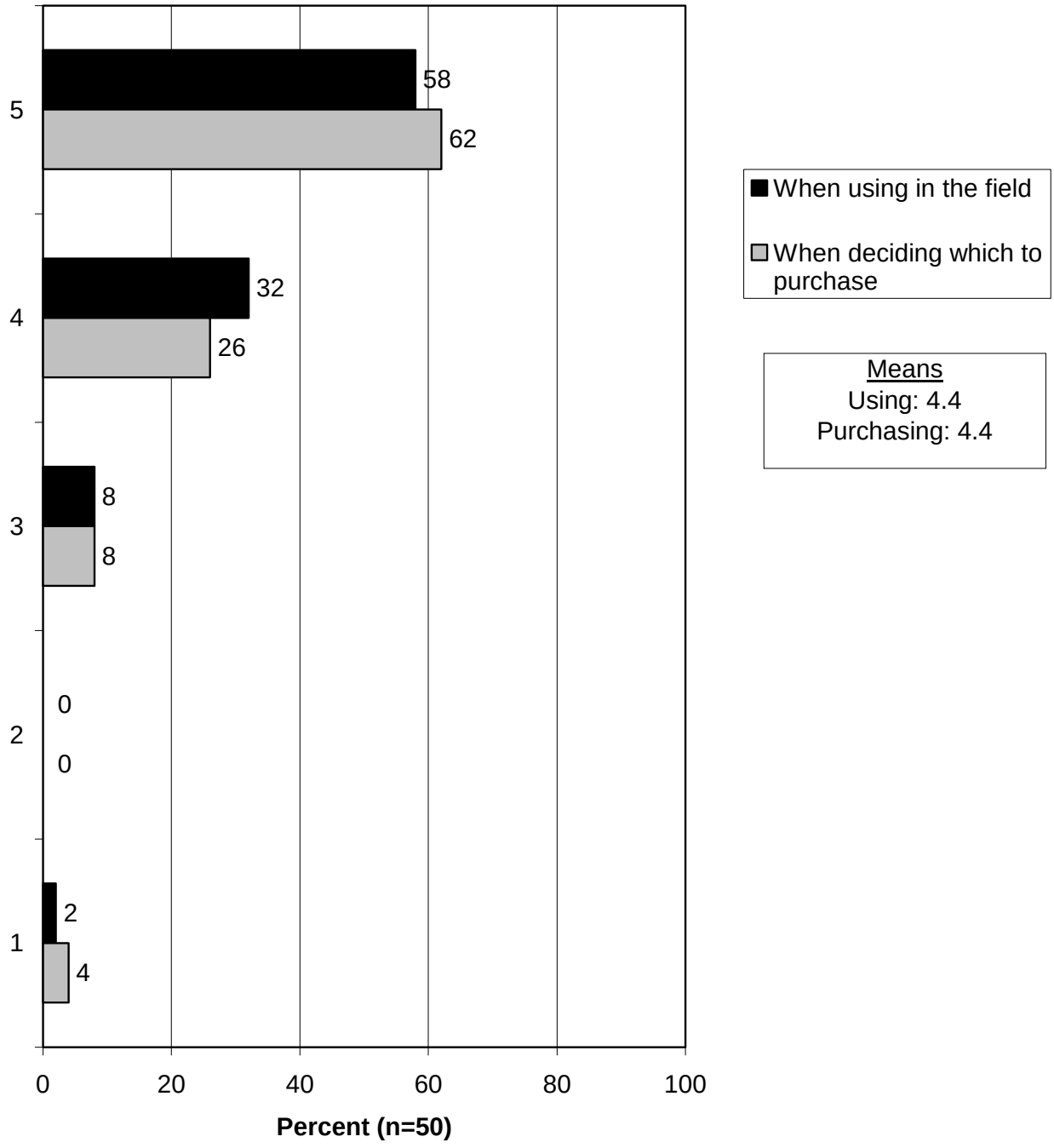
- Respondents rated product support/warranty/vendor reputation as an important characteristic when using (40%) and when purchasing (34%) in situ chlorophyll fluorometers. When asked to rate product support/warranty/vendor reputation on a scale of 1 to 5, with 5 being very important, the mean of respondents' ratings of product support/warranty/vendor reputation was 4.1 when using fluorometers and 4.0 when purchasing fluorometers.

- Respondents commonly rated accuracy as an important characteristic when using (34%) and when purchasing (36%) in situ chlorophyll fluorometers. When asked to rate accuracy on a scale of 1 to 5, with 5 being very important, the mean of respondents' ratings of accuracy was 4.0 when using fluorometers and 4.0 when purchasing fluorometers.

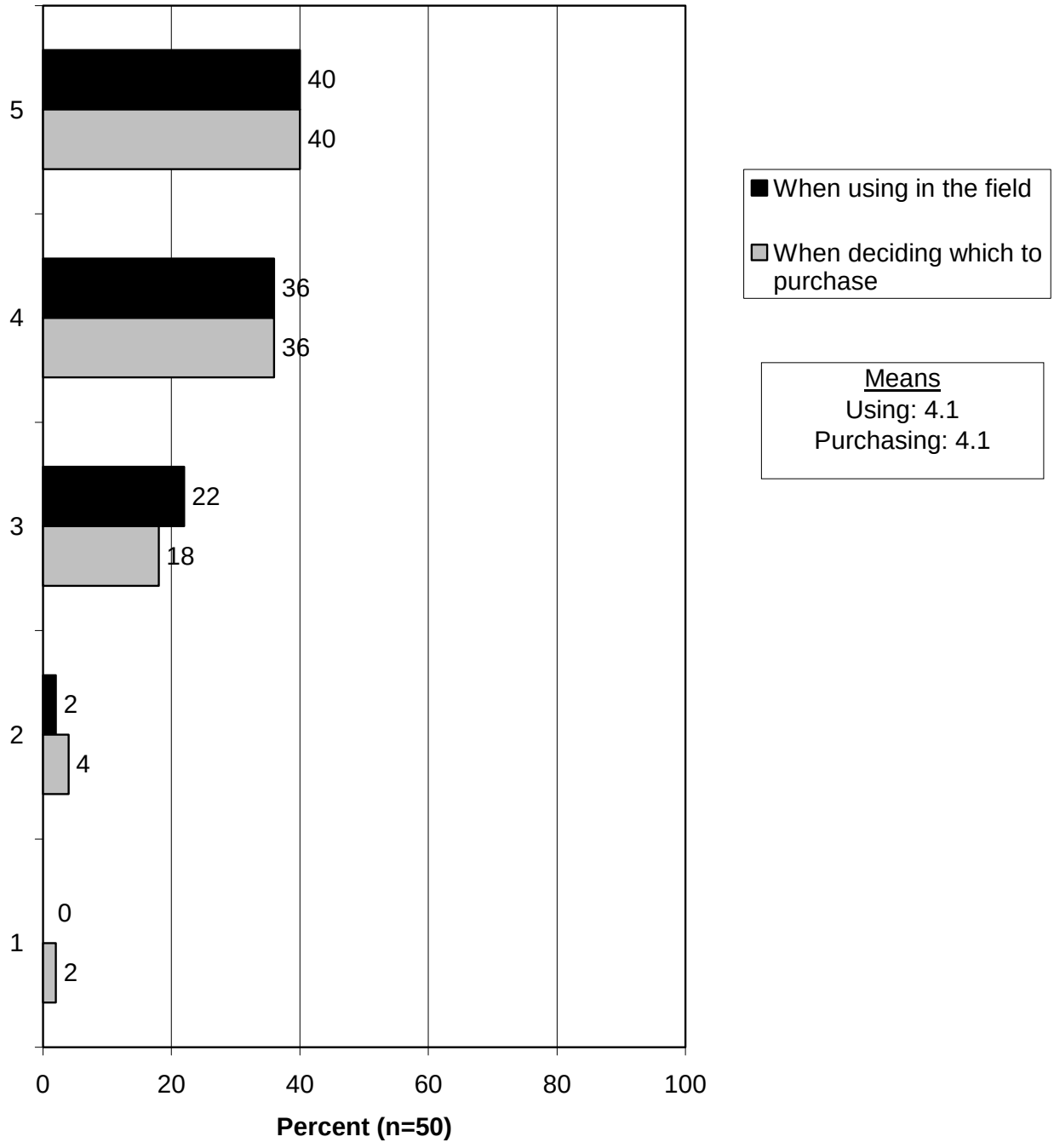
Q44, Q63. Importance of the reliability of chlorophyll fluorometers.



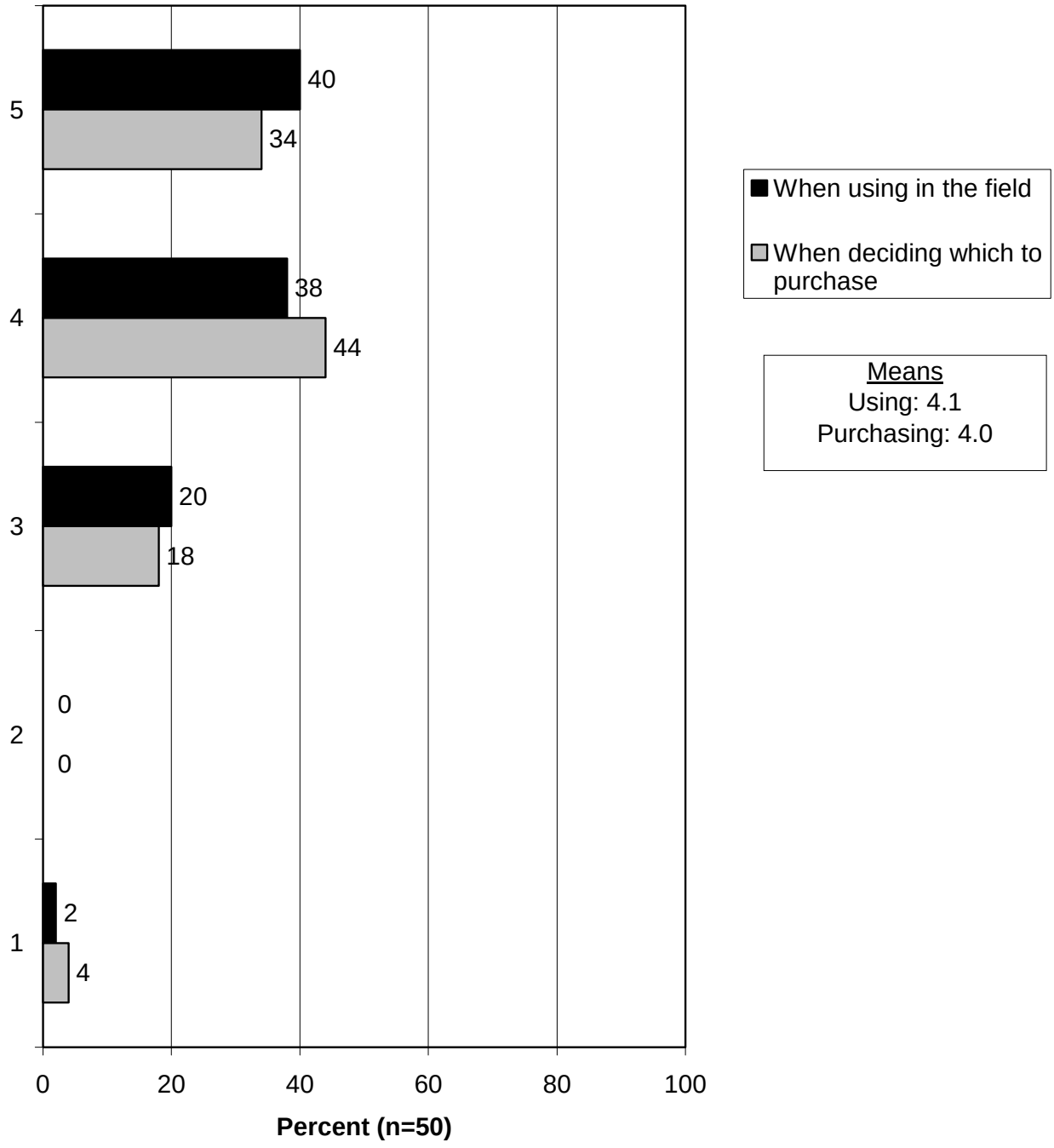
Q40, Q59. Importance of the range/detection limits of chlorophyll fluorometers.



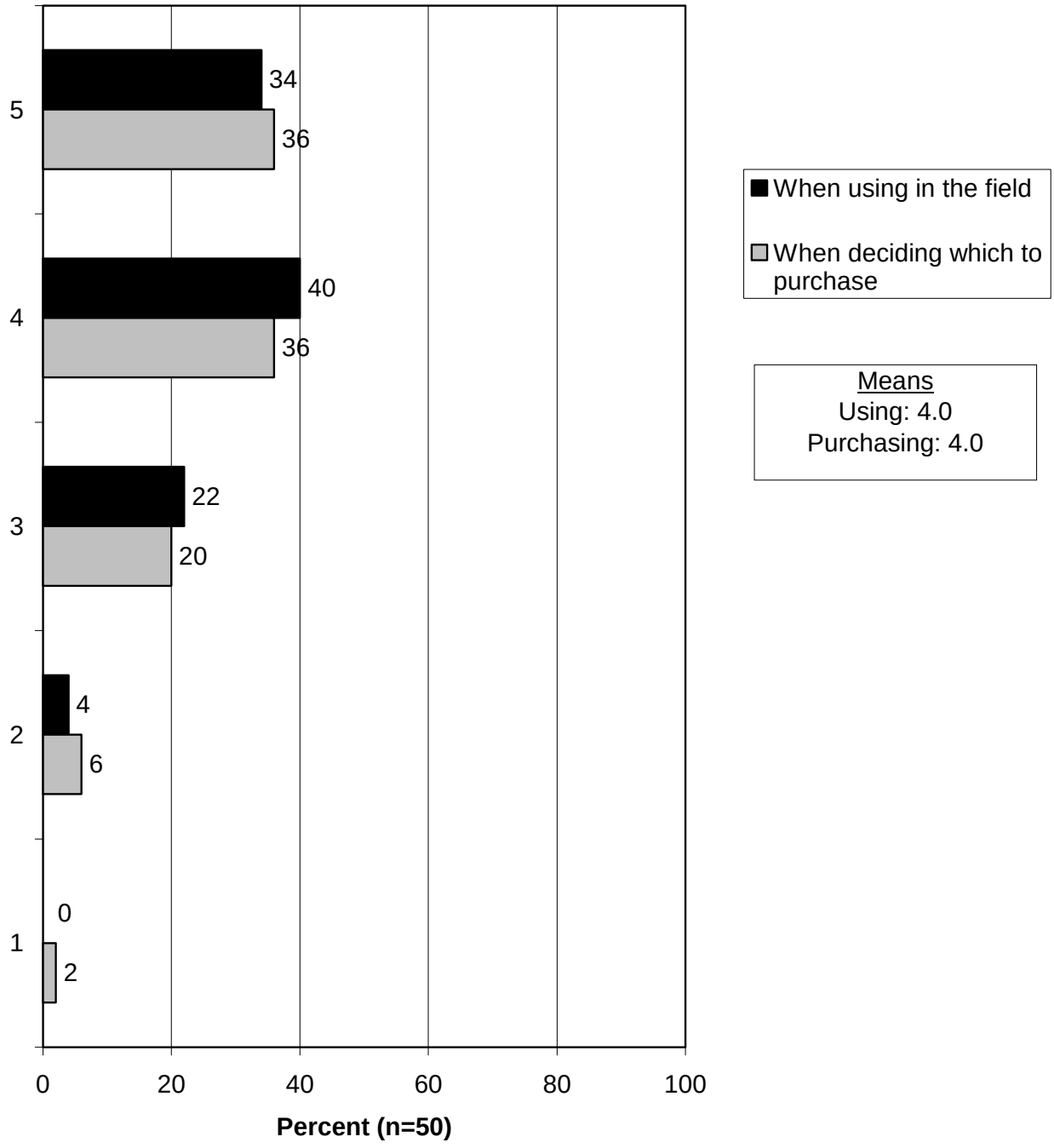
Q42, Q61. Importance of the precision of chlorophyll fluorometers.



Q56, Q75. Importance of product support/warranty/vendor reputation of chlorophyll fluorometers.



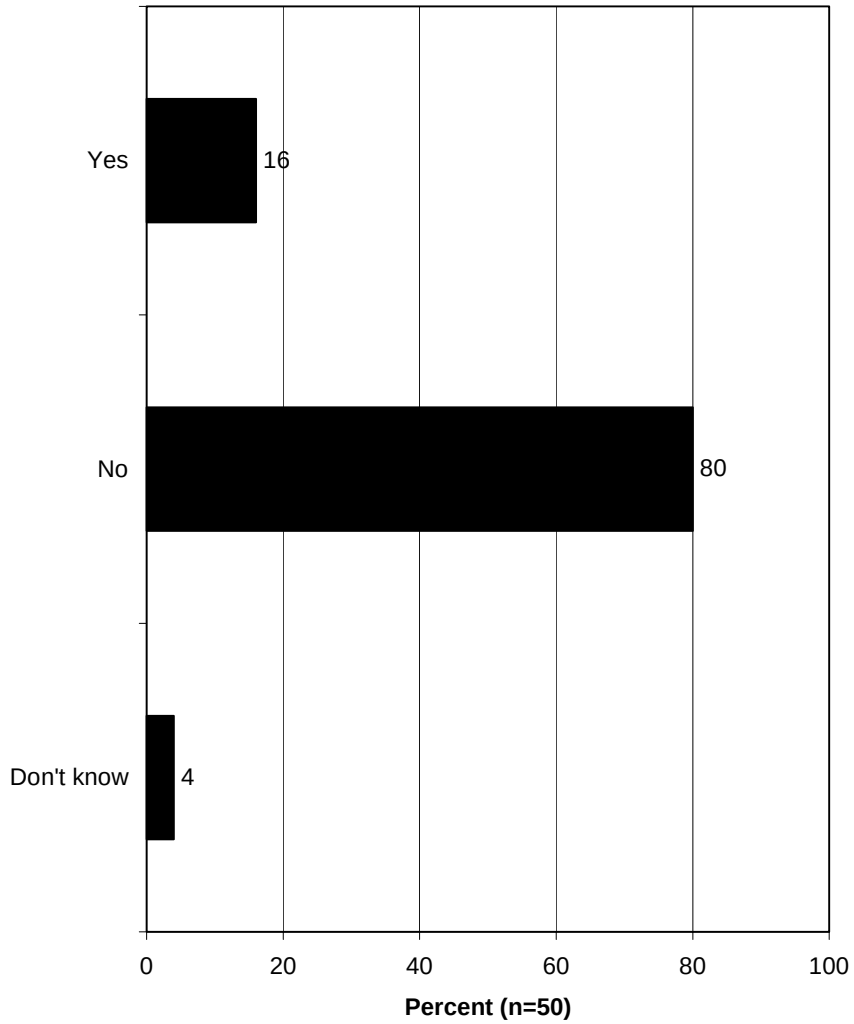
Q41, Q60. Importance of the accuracy of chlorophyll fluorometers.



CUSTOM CHARACTERISTICS

- A majority (80%) of respondents' sensor requirements are standard; 16% of respondents' sensor requirements are custom, or "non-standard", characteristics.
  - Of those whose sensor requirements are custom characteristics, one respondent reported changing the capabilities for integration; another respondent reported the need to characterize for the properties of chlorophyll.

Q78. Relative to the sensor system characteristics, are any of your sensor needs/requirements "non-standard" or custom?

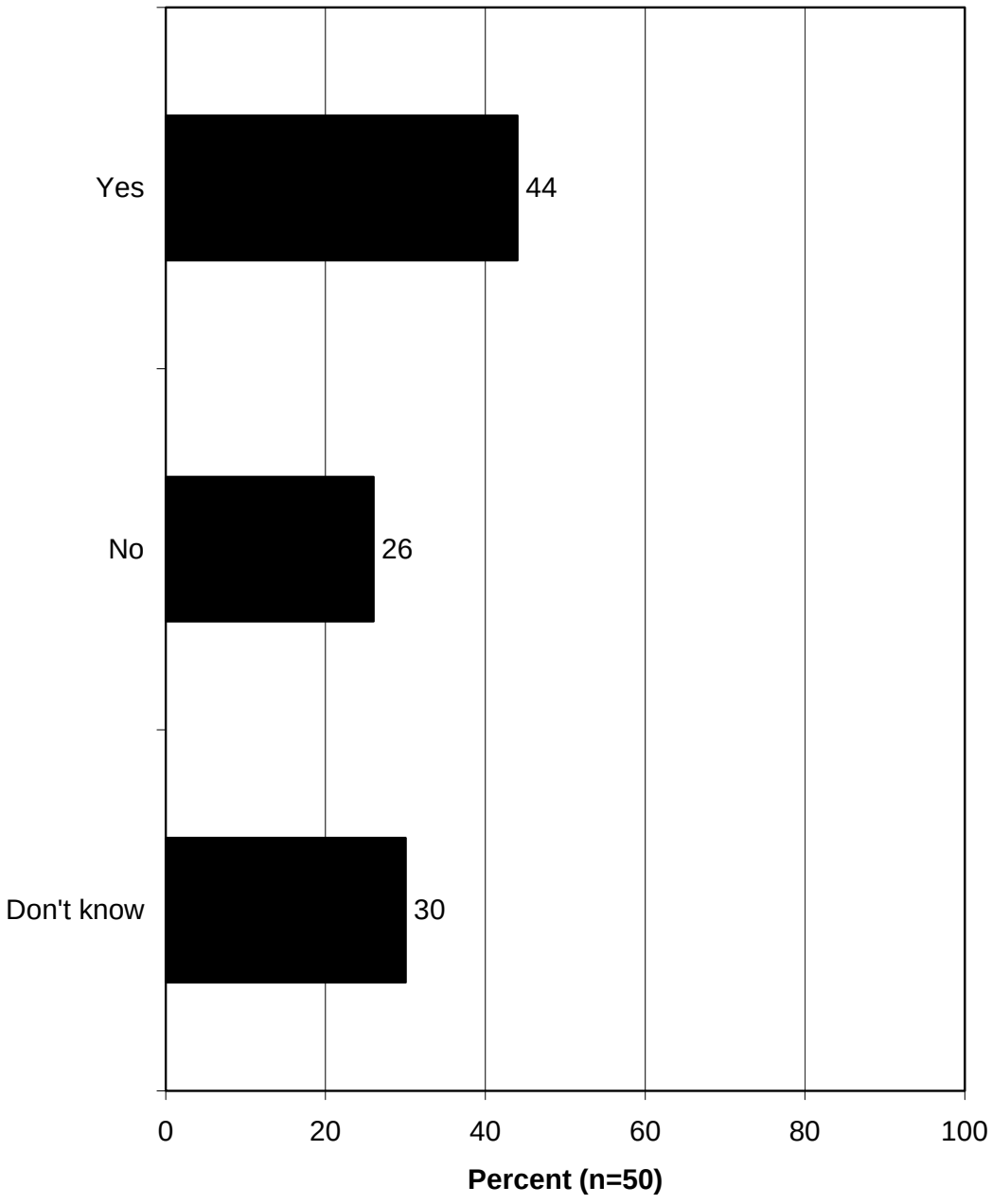


ANTICIPATED PURCHASES OF IN SITU CHLOROPHYLL FLUOROMETERS

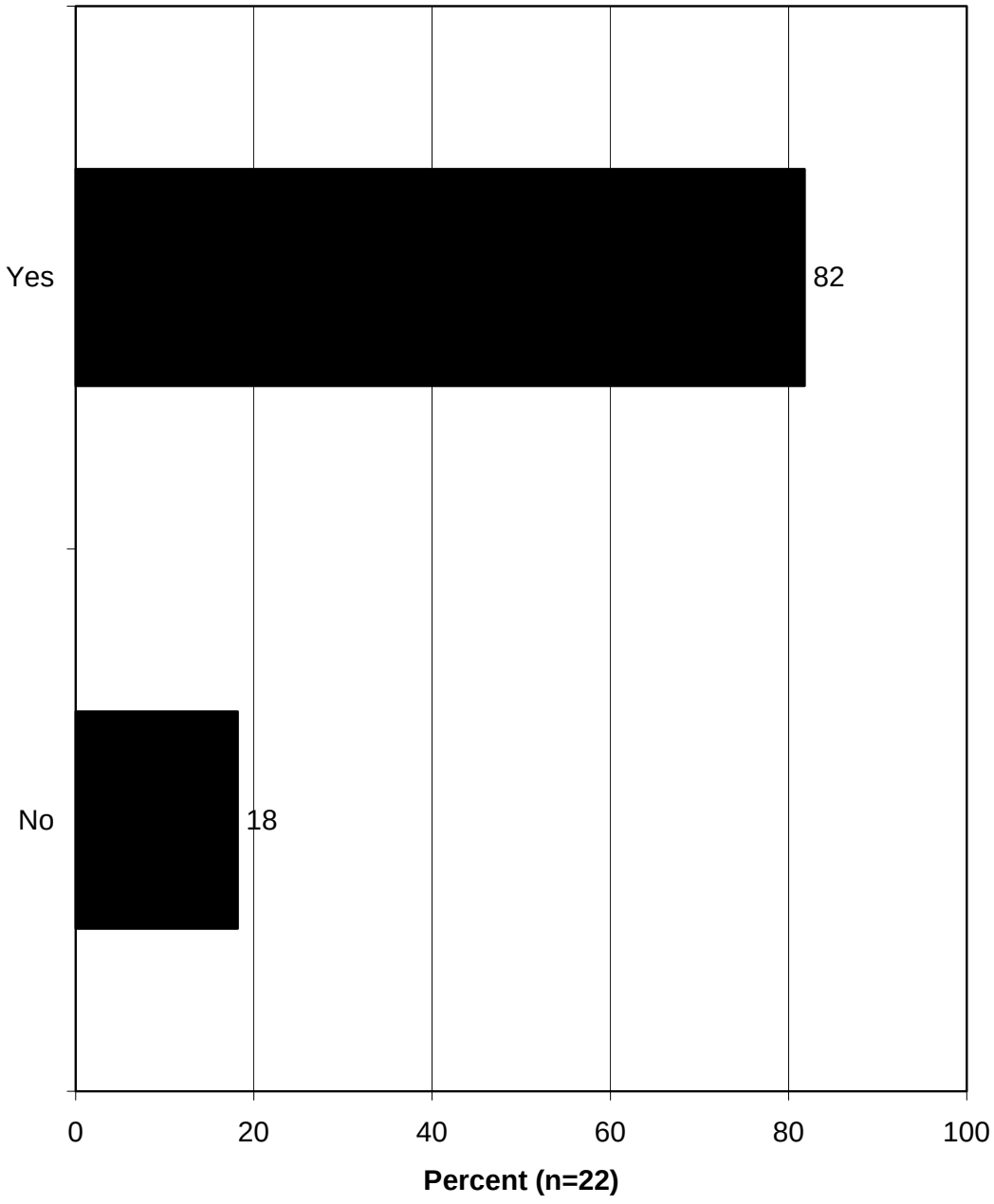
- A plurality (44%) of respondents plan to acquire new commercial sensors within the next 2 years; 26% do not plan to acquire new commercial sensors.

- A majority (82%) of respondents will consider using a different sensor type other than the one they are currently using to measure in situ chlorophyll; 18% will not consider using a different sensor type.
  - When asked why they would consider using a different sensor type, respondents cited smaller packaging, biofouling issues, and simply getting the best instrument for their money.
  - When asked why they would *not* consider using a different sensor type, respondents cited custom packaging, reliability, and satisfaction with current vendor.

Q83. Do you plan on acquiring new commercial sensors within the next 2 years?



Q84. Will you consider a different sensor type than the one you are currently using to measure in situ chlorophyll?



RECOMMENDATIONS TO IMPROVE CURRENT DESIGNS

- When asked for their recommendations to improve current designs, respondents most commonly reported the need to address poor accuracy and biofouling issues.

Additional recommendations to improve current designs are recorded below.

Accuracy seems to be the problem.
All in situ chlorophyll fluorometers fail in full sunlight; not a fault of sensor but of phytoplankton.
Need better attention to biofouling and steadiness of the in situ chlorophyll fluorometers.
Address depth limitations.
Need to improve ease of changing filters for use with other detection methods.
Need effective anti-biofouling methods.
Need an automated way to deal with biofouling of optical surfaces.
I believe straight voltage is better.
I would like to see them being made smaller in size and with lower power consumption.
We need improved accuracy.
(In situ chlorophyll fluorometers) need improved accuracy.
Address deployment biofouling issues.
Address the issue of calibration in the field and biofouling.
Need longer-lasting, reliable, anti-biofouling sensors with automated calibration.
Need to improve software and have some kind of reference standard for calibrations.

ADDITIONAL COMMENTS

Additional comments (general) are recorded below.

I am interested in helping with this. I have been doing this for 25 years and would be happy to help out, if possible. I would love to talk to someone about this outside of a boxed-in survey format.
I think there should be more education on what sensors can and cannot do. People try to do things with the sensor that it is not capable of doing; people blame the company when it is not the company's fault.
I am surprised "biological fouling" was not an option on the characteristic parameters list. I would like to see the ACT report when it is completed; please send me a copy.

SURVEY INSTRUMENT

2004 ACT In Situ Chlorophyll Fluorometer Survey

1. PRESS RETURN WHEN INTERVIEW BEGINS

   START

   TIMER STARTS AFTER THIS SCREEN

2. DOS SURVEY NAME

   SNAME 1:1

   (CHECK ONLY ONE ANSWER)

   |__| 1. ACTFL

3. Hello, my name is _____, may I please speak with _____?
   I am calling on behalf of the Alliance for Coastal Technologies to ask you some questions about in situ chlorophyll fluorometers usage and capabilities. We are not selling anything and would just like a few minutes of your time. Will you help us by completing the interview?

   CONPER 1:2

   (CHECK ONLY ONE ANSWER)

   |__| 1. Correct person, good time to do survey
   |__| 2. Bad time/Schedule recall
   |__| 3. Answering machine/No answer/Busy signal
   |__| 4. Refusal
   |__| 5. Not eligible
   |__| 6. Disconnected
   |__| 7. Business/Government Office
   |__| 8. Deaf/Language barrier
   |__| 9. Bad Number (missing digit, begins with zero, etc.)

4. Time when interview began

   TIME1 1:3-7

   |__|__|__|__|__|

2004 ACT In Situ Chlorophyll Fluorometer Survey Page 2

5. DETERMINATION OF SURVEY SKIP PATH

PATH 1:8

(CHECK ONLY ONE ANSWER)

|__| 1. SKIP PATH

IF (#3 = 1) GO TO #7
IF (#3 = 2) GO TO #6

SKIP TO QUESTION 95

==========

6. When would be a more convenient time to call you back? Thank you for your time.

WHENCALL

ENTER DAY AND TIME ON CALLSHEET (CB)

SKIP TO QUESTION 95

==========

7. Which of the following best represents your primary sensor deployment area of interest or application concern? (READ LIST; CHECK ONLY ONE ANSWER)

SNSRAREA 1:9

(CHECK ONLY ONE ANSWER)

|__| 1. Invalid answer. Select another. (GO TO QUESTION 7)
|__| 2. Research
|__| 3. Resource management
|__| 4. Regulatory compliance / Permitting
|__| 5. Wastewater treatment
|__| 6. Aquaculture
|__| 7. Don't know
|__| 8. Other (GO TO QUESTION 8)

SKIP TO QUESTION 10

==========

8. ENTER OTHER SENSOR DEPLOYMENT AREAS OF INTEREST OR APPLICATION CONCERN.

OTHAREAS 1:10-249

_____

_____

_____

SKIP TO QUESTION 10

==========

2004 ACT In Situ Chlorophyll Fluorometer Survey Page 3

9. YOU DID NOT USE SPACE BAR

NOSPAC01

PRESS ENTER TO TRY AGAIN

10. Which of the following represent your primary investigation/ monitoring environments? (READ LIST; CHECK ALL THAT APPLY)

MONENV 2:1-10

(CHECK ALL THAT APPLY)

|__| 1. Bluewater / marine
|__| 2. Coastal / near shore
|__| 3. Shallow water (< 10 meters depth)
|__| 4. Intermediate depths (10 - 100 meters)
|__| 5. Deep water (> 100 meters depth)
|__| 6. Estuarine
|__| 7. Rivers / lakes / freshwater wetlands
|__| 8. Industrial (aquaculture operations/water & wastewater treatment)
|__| 9. Don't know
|__| 10. Other

IF (#10 = 0) GO TO #9
IF (#10 @ 10) GO TO #11

SKIP TO QUESTION 12
==========

11. ENTER OTHER INVESTIGATION/MONITORING ENVIRONMENT.

MONENVST 2:11-250

_____

_____

_____

12. Do you currently use in situ chlorophyll fluorometer sensors?

USEISCFS 3:1

(CHECK ONLY ONE ANSWER)

|__| 1. Invalid answer. Select another. (GO TO QUESTION 12)
|__| 2. Yes (GO TO QUESTION 14)
|__| 3. No
|__| 4. Don't know

SKIP TO QUESTION 40
==========

2004 ACT In Situ Chlorophyll Fluorometer Survey Page 4

13. YOU DID NOT USE SPACE BAR

NOSPAC02

PRESS ENTER TO TRY AGAIN

14. What are your most common applications?
(READ LIST; CHECK ALL THAT APPLY)

COMAPP 3:2-10

(CHECK ALL THAT APPLY)

|__| 1. Hand held / portable sensors for spot measurements
|__| 2. Sensor as part of a suite of instruments used for profiling
|__| 3. Deployed sensor on remote platforms for continuous in-situ
|__| 4. monitoring (GO TO QUESTION 14)
|__| 5. Flow-through system on a vessel for periodic surveys, transects, etc.
|__| 6. Flow-through system on a vessel in long-term use (e.g., ferry)
|__| 7. In-line monitoring for water treatment systems
|__| 8. Don't know
|__| 9. Other

IF (#14 = 0) GO TO #13
IF (#14 @ 9) GO TO #15

SKIP TO QUESTION 16
==========

15. ENTER OTHER APPLICATION.

COMAPPST 3:11-250

_____

_____

_____

16. Are your current sensors..?
(READ LIST; CHECK ONLY ONE ANSWER)

SNSTYP 4:1

(CHECK ONLY ONE ANSWER)

|__| 1. Primarily commercial products
|__| 2. Primarily designs you developed yourself
|__| 3. A combination of both
|__| 4. Don't know

SKIP TO QUESTION 18
==========

17. YOU DID NOT USE SPACE BAR

NOSPAC03

PRESS ENTER TO TRY AGAIN

2004 ACT In Situ Chlorophyll Fluorometer Survey Page 5

18. In which of the following areas does the in situ chlorophyll fluorometers that you are currently using have significant limitations, not lived up to specifications or expectations, or does not meet your needs? (READ LIST; CHECK ALL THAT APPLY)
LIMIT1 4:2-13

(CHECK ALL THAT APPLY)

|__| 1. Range / detection limits
|__| 2. Accuracy (Accuracy is the combination of bias and precision of
|__| 3. an analytical procedure, which reflects the closeness of (GO TO QUESTION 18)
|__| 4. the measured value to the true value.) (GO TO QUESTION 18)
|__| 5. Precision (Precision is the measure of the degree of agreement
|__| 6. among replicate measurements of a sample, usually expressed (GO TO QUESTION 18)
|__| 7. as a standard deviation.) (GO TO QUESTION 18)
|__| 8. Sampling interval / frequency
|__| 9. Reliability (Reliability is the measure of the ability to
|__| 10. maintain integrity of the instrument and data collections (GO TO QUESTION 18)
|__| 11. over time.) (GO TO QUESTION 18)
|__| 12. DNR: None of these

IF (#18 = 0) GO TO #17

SKIP TO QUESTION 20

==========

19. YOU DID NOT USE SPACE BAR
NOSPAC04

PRESS ENTER TO TRY AGAIN

2004 ACT In Situ Chlorophyll Fluorometer Survey Page 6

20. Continues from previous list...
(READ LIST; CHECK ALL THAT APPLY)

LIMIT2 4:14-28

(CHECK ALL THAT APPLY)

|__| 1. Operating life
|__| 2. Operating pressure / depth range
|__| 3. Flow sensitivity
|__| 4. Calibration life
|__| 5. Automatic calibration
|__| 6. Ease of calibration
|__| 7. Real-time sensor data display and/or analysis
|__| 8. Off-sensor telemetry
|__| 9. Input / output interfaces (e.g., computers, alarms, to other
|__| 10. sensors or equipment etc.) (GO TO QUESTION 20)
|__| 11. Packaging
|__| 12. In-field maintenance
|__| 13. Quality of product handbook / documentation
|__| 14. Cost
|__| 15. Other

IF (#20 = 0) GO TO #19
IF (#20 @ 15) GO TO #21
IF (#18 @ 1) GO TO #22
IF (#18 @ 2) GO TO #23
IF (#18 @ 5) GO TO #24
IF (#18 @ 8) GO TO #25
IF (#18 @ 9) GO TO #26
IF (#20 @ 1) GO TO #27
IF (#20 @ 2) GO TO #28
IF (#20 @ 3) GO TO #29
IF (#20 @ 4) GO TO #30
IF (#20 @ 5) GO TO #31
IF (#20 @ 6) GO TO #32
IF (#20 @ 7) GO TO #33
IF (#20 @ 8) GO TO #34
IF (#20 @ 9) GO TO #35
IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40
==========

2004 ACT In Situ Chlorophyll Fluorometer Survey Page 7

21. ENTER OTHER AREAS THAT HAVE NOT LIVED UP TO SPECIFICATIONS OR EXPECTATIONS, OR DOES NOT MEET YOUR NEEDS.
LIMITST 5:1-240

_____

_____

_____

IF (#18 @ 1) GO TO #22
IF (#18 @ 2) GO TO #23
IF (#18 @ 5) GO TO #24
IF (#18 @ 8) GO TO #25
IF (#18 @ 9) GO TO #26
IF (#20 @ 1) GO TO #27
IF (#20 @ 2) GO TO #28
IF (#20 @ 3) GO TO #29
IF (#20 @ 4) GO TO #30
IF (#20 @ 5) GO TO #31
IF (#20 @ 6) GO TO #32
IF (#20 @ 7) GO TO #33
IF (#20 @ 8) GO TO #34
IF (#20 @ 9) GO TO #35
IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40
==========

22. What were the issues with range / detection limits that had significant limitations or did not live up to specifications or expectations?

WHTRNG 6:1-240

_____

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_____

IF (#18 @ 2) GO TO #23
IF (#18 @ 5) GO TO #24
IF (#18 @ 8) GO TO #25
IF (#18 @ 9) GO TO #26
IF (#20 @ 1) GO TO #27
IF (#20 @ 2) GO TO #28
IF (#20 @ 3) GO TO #29
IF (#20 @ 4) GO TO #30
IF (#20 @ 5) GO TO #31
IF (#20 @ 6) GO TO #32
IF (#20 @ 7) GO TO #33
IF (#20 @ 8) GO TO #34
IF (#20 @ 9) GO TO #35
IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40

==========

2004 ACT In Situ Chlorophyll Fluorometer Survey Page 9

23. What were the issues with accuracy that had significant limitations or did not live up to specifications or expectations?

WHTACC 7:1-240

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IF (#18 @ 5) GO TO #24
IF (#18 @ 8) GO TO #25
IF (#18 @ 9) GO TO #26
IF (#20 @ 1) GO TO #27
IF (#20 @ 2) GO TO #28
IF (#20 @ 3) GO TO #29
IF (#20 @ 4) GO TO #30
IF (#20 @ 5) GO TO #31
IF (#20 @ 6) GO TO #32
IF (#20 @ 7) GO TO #33
IF (#20 @ 8) GO TO #34
IF (#20 @ 9) GO TO #35
IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40

==========

2004 ACT In Situ Chlorophyll Fluorometer Survey Page 10

24. What were the issues with precision that had significant limitations or did not live up to specifications or expectations?

WHTPRC 8:1-240

_____

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_____

IF (#18 @ 8) GO TO #25
IF (#18 @ 9) GO TO #26
IF (#20 @ 1) GO TO #27
IF (#20 @ 2) GO TO #28
IF (#20 @ 3) GO TO #29
IF (#20 @ 4) GO TO #30
IF (#20 @ 5) GO TO #31
IF (#20 @ 6) GO TO #32
IF (#20 @ 7) GO TO #33
IF (#20 @ 8) GO TO #34
IF (#20 @ 9) GO TO #35
IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40

==========

2004 ACT In Situ Chlorophyll Fluorometer Survey Page 11

25. What were the issues with sampling interval/frequency that had significant limitations or did not live up to specifications or expectations?

WHTFRQ 9:1-240

_____

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IF (#18 @ 9) GO TO #26
IF (#20 @ 1) GO TO #27
IF (#20 @ 2) GO TO #28
IF (#20 @ 3) GO TO #29
IF (#20 @ 4) GO TO #30
IF (#20 @ 5) GO TO #31
IF (#20 @ 6) GO TO #32
IF (#20 @ 7) GO TO #33
IF (#20 @ 8) GO TO #34
IF (#20 @ 9) GO TO #35
IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40

==========

26. What were the issues with Reliability that had significant limitations or did not live up to specifications or expectations?
WHTREL 10:1-240

_____

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_____

IF (#20 @ 1) GO TO #27
IF (#20 @ 2) GO TO #28
IF (#20 @ 3) GO TO #29
IF (#20 @ 4) GO TO #30
IF (#20 @ 5) GO TO #31
IF (#20 @ 6) GO TO #32
IF (#20 @ 7) GO TO #33
IF (#20 @ 8) GO TO #34
IF (#20 @ 9) GO TO #35
IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40
==========

27. What were the issues with operating life that had significant limitations or did not live up to specifications or expectations?
WHTLIF 11:1-240

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IF (#20 @ 2) GO TO #28
IF (#20 @ 3) GO TO #29
IF (#20 @ 4) GO TO #30
IF (#20 @ 5) GO TO #31
IF (#20 @ 6) GO TO #32
IF (#20 @ 7) GO TO #33
IF (#20 @ 8) GO TO #34
IF (#20 @ 9) GO TO #35
IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40
==========

2004 ACT In Situ Chlorophyll Fluorometer Survey Page 13

28. What were the issues with operating pressure/depth range that had significant limitations or did not live up to specifications or expectations?

WHTDPT 12:1-240

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IF (#20 @ 3) GO TO #29
IF (#20 @ 4) GO TO #30
IF (#20 @ 5) GO TO #31
IF (#20 @ 6) GO TO #32
IF (#20 @ 7) GO TO #33
IF (#20 @ 8) GO TO #34
IF (#20 @ 9) GO TO #35
IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40

==========

29. What were the issues with flow sensitivity that had significant limitations or did not live up to specifications or expectations?

WHTFLO 13:1-240

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_____

_____

IF (#20 @ 4) GO TO #30
IF (#20 @ 5) GO TO #31
IF (#20 @ 6) GO TO #32
IF (#20 @ 7) GO TO #33
IF (#20 @ 8) GO TO #34
IF (#20 @ 9) GO TO #35
IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40

==========

2004 ACT In Situ Chlorophyll Fluorometer Survey Page 14

30. What were the issues with calibration life that had significant limitations or did not live up to specifications or expectations?
WHTCAL 14:1-240
_____

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IF (#20 @ 5) GO TO #31
IF (#20 @ 6) GO TO #32
IF (#20 @ 7) GO TO #33
IF (#20 @ 8) GO TO #34
IF (#20 @ 9) GO TO #35
IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40
==========

31. What were the issues with automatic calibration that had significant limitations or did not live up to specifications or expectations?
WHTAUT 15:1-240
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IF (#20 @ 6) GO TO #32
IF (#20 @ 7) GO TO #33
IF (#20 @ 8) GO TO #34
IF (#20 @ 9) GO TO #35
IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40
==========

2004 ACT In Situ Chlorophyll Fluorometer Survey Page 15

32. What were the issues with ease of calibration that had significant limitations or did not live up to specifications or expectations?

WHTEZ 16:1-240

_____

_____

_____

IF (#20 @ 7) GO TO #33
IF (#20 @ 8) GO TO #34
IF (#20 @ 9) GO TO #35
IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40

==========

33. What were the issues with real-time sensor data display and/or analysis that had significant limitations or did not live up to specifications or expectations?

WHTTIM 17:1-240

_____

_____

_____

IF (#20 @ 8) GO TO #34
IF (#20 @ 9) GO TO #35
IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40

==========

2004 ACT In Situ Chlorophyll Fluorometer Survey Page 16

34. What were the issues with off-sensor telemetry that had significant limitations or did not live up to specifications or expectations?

WHTOST 18:1-240

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IF (#20 @ 9) GO TO #35
IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40

==========

35. What were the issues with input / output interfaces that had significant limitations or did not live up to specifications or expectations?

WHTIO 19:1-240

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_____

_____

IF (#20 @ 11) GO TO #36
IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40

==========

36. What were the issues with packaging that had significant limitations or did not live up to specifications or expectations?

WHTPKG 20:1-240

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_____

_____

IF (#20 @ 12) GO TO #37
IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40
==========

37. What were the issues with in-field maintenance that had significant limitations or did not live up to specifications or expectations?

WHTIFM 21:1-240

_____

_____

_____

IF (#20 @ 13) GO TO #38
IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40
==========

38. What were the issues with quality of product handbook/ documentation that had significant limitations or did not live up to specifications or expectations?

WHTBK 22:1-240

_____

_____

_____

IF (#20 @ 14) GO TO #39

SKIP TO QUESTION 40
==========

39. What were the issues with cost that had significant limitations or did not live up to specifications or expectations?
WHTCST 23:1-240
_____
_____
_____

40. How important are the following characteristics to you when USING chlorophyll fluorometers in the field? Please rate each characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important.

The first characteristic is range/detection limits. (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)
IMPRANGE 23:241
|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

41. Accuracy (Accuracy is the combination of bias and precision of an analytical procedure, which reflects the closeness of the measured value to the true value.)? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)
IMPACRCY 23:242
|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

42. Precision (Precision is the measure of the degree of agreement among replicate measurements of a sample, usually expressed as a standard deviation.)? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)
IMPPRCSN 23:243
|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

43. Sampling interval/frequency? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

IMPFRQCY 23:244

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

44. Reliability (Reliability is the measure of the ability to maintain integrity of the instrument and data collections over time.) (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

IMPRBLTY 23:245

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

45. Operating life? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

IMPOPLIF 23:246

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

46. Operating pressure/depth range? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

IMPDEPTH 23:247

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

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47. Flow sensitivity? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

IMPFLOW 23:248

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

48. Calibration life? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

IMPCLLIF 23:249

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

49. Automatic calibration? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

IMPAUTO 23:250

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

50. Ease of calibration? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

IMPEASE 24:1

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

51. Real-time sensor data display and/or analysis? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

IMPRLTIM 24:2

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

52. Off-sensor telemetry? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

IMPOST 24:3

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

53. Input/output interfaces (e.g., computers, alarms, etc)? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

IMPOPINT 24:4

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

54. Packaging? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

IMPPCKAG 24:5

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

55. In-field maintenance? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

IMPIFM 24:6

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

56. Product support/warranty/vendor reputation? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)
IMPREP 24:7

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

57. Quality of product handbook/documentation? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)
IMPBOOK 24:8

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

58. Cost? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)
IMPCOST 24:9

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

59. How important are the following characteristics to you when deciding which chlorophyll fluorometer(s) to PURCHASE? Please rate each characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important.

The first characteristic is range/detection limits. (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)
PURRANGE 24:10

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

60. Accuracy (Accuracy is the combination of bias and precision of an analytical procedure, which reflects the closeness of the measured value to the true value.)? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PURACC 24:11

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

61. Precision (Precision is the measure of the degree of agreement among replicate measurements of a sample, usually expressed as a standard deviation.) (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PURPRC 24:12

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

62. Sampling interval/frequency? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PURFRQ 24:13

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

63. Reliability (Reliability is the measure of the ability to maintain integrity of the instrument and data collections over time.) (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PURREL 24:14

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

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64. Operating life? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PUROPLIF 24:15

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

65. Operating pressure/depth range? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PURDEPTH 24:16

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

66. Flow sensitivity? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PURFLOW 24:17

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

67. Calibration life? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PURCLLIF 24:18

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

68. Automatic calibration? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PURAUTO 24:19

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

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69. Ease of calibration? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PUREASE 24:20

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

70. Real-time sensor data display and/or analysis? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PURTIME 24:21

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

71. Off-sensor telemetry? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PUROST 24:22

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

72. Input/output interfaces (e.g., computers, alarms, etc)? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PURIOINT 24:23

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

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73. Packaging? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PURPACK 24:24

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

74. In-field maintenance? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PURIFM 24:25

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

75. Product support/warranty/vendor reputation? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PURREP 24:26

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

76. Quality of product handbook/documentation? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PURBOOK 24:27

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

77. Cost? (How would you rate this characteristic on a scale of 1 to 5, where 1 is not at all important and 5 is very important?)

PURCOST 24:28

|__|

LOWEST VALUE = 1
HIGHEST VALUE = 5

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78. Relative to the above sensor system characteristics, are any of your sensor needs or requirements "non-standard" or custom?
CUSTOM 24:29

(CHECK ONLY ONE ANSWER)

|__| 1. Invalid answer. Select another. (GO TO QUESTION 78)
|__| 2. Yes (GO TO QUESTION 79)
|__| 3. No
|__| 4. Don't know

SKIP TO QUESTION 80
==========

79. ENTER OTHER "NON-STANDARD" OR CUSTOM CHARACTERISTICS.
CUSTOMST 25:1-240

_____

_____

_____

80. Do you use your in situ chlorophyll fluorometer to determine absolute chlorophyll concentrations or only the relative changes? (READ LIST; CHECK ALL THAT APPLY.)
ABORREL 25:241

(CHECK ONLY ONE ANSWER)

|__| 1. Invalid answer. Select another. (GO TO QUESTION 80)
|__| 2. Absolute concentrations only (GO TO QUESTION 81)
|__| 3. Relative changes only
|__| 4. Both (GO TO QUESTION 81)
|__| 5. Don't know

SKIP TO QUESTION 83
==========

81. When using your fluorometer for determining absolute concentrations, do you conduct your own absolute calibrations?
ABSOLCAL 25:242

(CHECK ONLY ONE ANSWER)

|__| 1. Invalid answer. Select another. (GO TO QUESTION 81)
|__| 2. Yes (GO TO QUESTION 82)
|__| 3. No
|__| 4. Don't know

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82. What method do you use to calibrate your fluorometer for determining absolute concentrations?

METHOD 26:1-240

_____

_____

_____

83. Do you plan on acquiring new commercial sensors within the next 2 years?

BUYNEW 26:241

(CHECK ONLY ONE ANSWER)

|__| 1. Invalid answer. Select another. (GO TO QUESTION 83)
|__| 2. Yes (GO TO QUESTION 84)
|__| 3. No
|__| 4. Don't know

SKIP TO QUESTION 87

==========

84. Will you consider a different sensor type than the one you are currently using to measure in situ chlorophyll?

DIFFSENS 26:242

(CHECK ONLY ONE ANSWER)

|__| 1. Invalid answer. Select another. (GO TO QUESTION 84)
|__| 2. Yes (GO TO QUESTION 85)
|__| 3. No (GO TO QUESTION 86)
|__| 4. Don't know

SKIP TO QUESTION 87

==========

85. Why will you consider using a different sensor type than the one you are currently using to measure in situ chlorophyll?

WHYDIF 27:1-240

_____

_____

_____

SKIP TO QUESTION 87

==========

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86. Why will you not consider using a different sensor type than the one you are currently using to measure in situ chlorophyll?
NODIF 28:1-240
_____
_____
_____

87. Based on your experience with in situ chlorophyll fluorometers, are there any shortfalls in current designs or additions you'd like to see in future designs?
SHRTFALL 29:1-240
_____
_____
_____

88. That's the end of the questionnaire, thank you very much for your time and cooperation!
(ENTER ANY ADDITIONAL COMMENTS; IN FIRST PERSON; 240 CHARACTERS)
END 30:1-240
_____
_____
_____

SKIP TO QUESTION 90
==========

89. YOU HAVE INDICATED A TERMINATED INTERVIEW, IS THIS CORRECT?
TM 30:241
(CHECK ONLY ONE ANSWER)

|__| 1. Invalid answer. Select another. (GO TO QUESTION 89)
|__| 2. Yes, save as a terminated interview (GO TO QUESTION 90)
|__| 3. No, take me back to the survey
|__| 4. No, I'd like to exit the survey (GO TO QUESTION 96)

SKIP TO QUESTION 5
==========

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90. OBSERVE AND RECORD RESPONDENT'S GENDER
GENDER 30:242

(CHECK ONLY ONE ANSWER)

|__| 1. Invalid answer. Select another. (GO TO QUESTION 90)
|__| 2. Uncertain
|__| 3. Male
|__| 4. Female

91. ENTER RM CASE NUMBER.
CASENO 30:243-247

|__|__|__|__|__|

92. TIME INTERVIEW WAS COMPLETED
ENDTIME 31:1-5

|__|__|__|__|__|

93. Please enter your initials in LOWERCASE ONLY!
INTVRINT 31:6-8

|__|__|__|

94. Enter the area code and telephone number of number dialed.
TELEPHON 31:9-18

|__|__|__|-|__|__|__|-|__|__|__|__|

LOWEST VALUE = 1

95. DETERMINES RESULT CODE FOR CALL
RESULT 31:19-20

(CHECK ONLY ONE ANSWER)

|__| 1. Completed survey
|__| 2. Call back
|__| 3. Answering machine/No answer/Busy signal
|__| 4. Refusal
|__| 5. Not eligible
|__| 6. Disconnected/Nonworking number
|__| 7. Business/Government office
|__| 8. Deaf/Language Barrier
|__| 9. Bad number (missing digit, begins with zero, etc.)
|__| 10. Terminated interview

COMPUTE IF (#89 = 2) 10
COMPUTE #3

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96. SAVE ALL INTERVIEWS, UNLESS
THIS IS A PRACTICE INTERVIEW!
FINISH 31:21
(CHECK ONLY ONE ANSWER)

|__| 1. Save answers (GO TO QUESTION 98)
|__| 2. Erase answers
|__| 3. Review answers (GO TO QUESTION 5)

97. ARE YOU SURE YOU WANT TO ERASE THIS INTERVIEW?
ONLY ERASE IF THIS IS A PRACTICE INTERVIEW!!!
MAKESURE 31:22
(CHECK ONLY ONE ANSWER)

|__| 1. No, do not erase the answers (GO TO QUESTION 96)
|__| 2. Yes, erase this interview, it is only practice

98. Date call was made
INTVDAT 31:23-30

|__|__|__|__|-|__|__|-|__|__|
Year Month Day

SAVE IF (#96 = 1)

APPENDIX A: Informative Letter Sent via Email to Prospective Survey Participants

Dear (Prospective Survey Participant),

This letter is to inform you of and ask for your participation in an upcoming study being conducted by Responsive Management on behalf of the Alliance for Coastal Technologies (ACT); a NOAA-funded partnership of research institutions, state and regional resource managers, and private sector companies interested in developing, improving, and applying sensor technologies for studying and monitoring coastal environments (www.act-us.info). Responsive Management is partnering with ACT to assess how various parties commonly use in situ fluorometers and what their requirements are for instrument performance. Your participation in this survey will assure that your opinions are represented when ACT develops protocols for their third-party performance evaluation of in situ fluorometers for measures of chlorophyll. The results of this assessment will also be sent to you and made available to the public in a summary report.

Responsive Management would like to set up an appointment to conduct a brief 10-minute survey with you regarding your attitudes toward in situ chlorophyll fluorometry. Please respond to this email as soon as you can to let us know when you can participate in the survey during the week of Wednesday, August 18 – Tuesday, August 31, 2004. Please also include a specific time (your local time) to contact you, as well as the best telephone number at which to reach you for the appointment.

If you know of other professionals knowledgeable about in situ chlorophyll fluorometers, please let us know so we can include their input, as well. I thank you for taking the time to complete this survey and to assist ACT in making technologies available to fulfill your needs.

Andrea Criscione
Research Associate
Responsive Management

Responsive Management is a nationally recognized public opinion and attitude survey research firm specializing in natural resource and outdoor recreation issues. Our mission is to help natural resource and outdoor recreation agencies and organizations better understand and work with their constituents and the public. Please visit our Web site at www.responsivemanagement.com.