WORKING GROUP ON SMARTDOTS GOVERNANCE (WGSMART; outputs from 2021 meeting)

International Council for the Exploration of the Sea
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i Executive summary

The Working Group on SmartDots Governance (WGSMART) was established in 2019 with the aim of overseeing and advising on the improvements needed to make SmartDots a fully functional tool for age reading and maturity staging exchanges, workshops and training exercises. In 2020, WGSMART facilitated and supported the further development of SmartDots as a tool for age reading calibration. The overall aim of the aforementioned developments is to improve the quality of the biological data used in the stock assessment and advice process, thus contribute to ICES's quality assurance framework (QAF).

Improvements to SmartDots are implemented in regular software update releases to address user feedback and to make existing features more user-friendly. Recent additions have included an onscreen measuring tool and otolith edge type descriptor, both of which can be used to support otolith and fish growth studies. In terms of quality assurance, an updated otolith reading quality grading scale was implemented for all age readings, which is also being implemented in the Regional Database & Estimation System (RDBES). WGSMART also proposed and supported the Workshop on use of Ageing and Maturity Staging Error Matrices in Stock Assessment (WKAMEMSA) in 2021, whose main aim was to bring together experts in quality assurance of stock assessment age and maturity data with the assessment model developers, and support an understanding of the importance of incorporating errors in the input data for stock assessment.

Ongoing efforts by WGSMART include upgrading and improving the reporting module r-scripts, user manuals and a series of online YouTube video tutorials for training. WGSMART has also continued to focus on planning for the future development of SmartDots. In 2021, this led to the formulation of a joint request from the Directorate-General for Maritime Affairs and Fisheries (DG MARE) and additional non-EU states to ICES to implement maturity and ichthyoplankton modules in the software. WGSMART envisions the streamlining of SmartDots with other data systems within the ICES community and will continuously work towards this in cooperation with other expert and Regional Coordination Groups.

ii Expert group information

Expert group name	The Working Group on SmartDots Governance (WGSMART)
Expert group cycle	Multiannual fixed term
Year cycle started	2019
Reporting year in cycle	3/3
Chair(s)	Julie Olivia Coad Davies, Denmark
	Jane Aanestad Godiksen, Norway
Meeting venue(s) and dates	7 February, online meeting 25 April, online meeting 12 September, online meeting 14 November, online meeting 11-12 October 2019, Lisbon, Portugal (8 participants)
	Online meetings (no physical meetings in 2020) 14 January (10 participants) 21 April (10 participants) 12 May (not registered) 8 September (11 participants) "alternative physical meeting" 23 October (10 participants) 26 November (13 participants) "alternative physical meeting"
	Online meetings (no physical meetings in 2021) 11 January 2021 (12 participants) 11 May (13 participants) 2 September (13 participants) 12 October (10 participants) 24-25 November (12 participants) "alternative physical meeting"

1 Purpose of the working group

The Working Group on SmartDots Governance (WGSMART) is devoted to oversee and advise on the improvements needed to make SmartDots a fully functional tool for age reading and maturity staging exchanges, workshops and training exercises.

SmartDots is essentially a platform for quality assurance of biological parameters as input for stock assessment. The focus of the group is to set prioritisation of recommendations, issues and requests for improvements addressed to SmartDots from the end-users. Feedback from the end-users will be compiled by WGSMART and appropriate actions to be taken with assigned responsibilities will be listed and prioritized. User manuals will be updated by WGSMART in line with all developments made. The group will also identify and facilitate training and outreach requirements.

WGSMART works in close collaboration with the Working Group on Biological Parameters (WGBIOP), where several members also are active members. These two groups will work together to identify future opportunities for development of SmartDots as a quality assurance platform.

2 Terms of Reference

ToR	Description	Background	Science Plan topics addressed	Duration	Expected Deliverables
a	Oversee and advise on the interpretation and prioritisation of recommendations and requests addressed to WGSMART.	SmartDots is an operational tool that aims to improve the overall quality of age data delivered to assessmsnt EG's. The tool is now operational and an integral part of the ICES QAQC for aging many fish species for which ICES provides advice, procedure largely under the guidance of WGBIOP. However maintenance and future development of the platform are beyond the scope of the scientific WG's and WK's.	3.1, 4.1	3 years/Generic ToR	A prioritised list of SmartDots related expert group recommendations with a proposed annual work plan to address concerns and implement improvements to SmartDots.
b	Provide a platform for end user feedback to the SmartDots system. User feedback will be requested from the end users via the GitHub site, exchange/workshop reports, EG'S and committes. Feedback will be compiled by WGSMART and appropriate actions to be taken with assigned responsibilities will be listed and prioritised.	SmartDots will be further developed to meet the requirements of a broad range of end users and thus needs to be responsive to user feedback. This feedback system needs to be independent of WGBIOP as a greater responsiveness (more than one meeting a year) is required to manage the system effectively.	3.1, 4.1	3 years/Generic ToR	
c	Elaborate a forward plan for the sustainability of SmartDots as a platform	To achieve a continous quality, SmartDots needs to be developed in line with end users needs. This development requires an input of resources; knowledge, expertise, manpower and funding over a period of time which extends beyond the initial phase. A workplan with clear objectives and milestones can only be sucessfully implemented when the availability of such resources is clear.	4.4, 3.6	3 years/Generic ToR	A workplan outlining what resources are required for development, support, training and dissenimation of relevant information. An estimated budget including identified funding resouces.
d	Oversee development of user guidance and training in SmartDots	As SmartDots develops overtime a range of users will require various levels of training including step by step user manuals, tutorials and possibly workshops. Documentation of	3.1, 4.1	3 years/Generic ToR	Annually updated training documentation. Workshops with specific goals proposed and planned where necessary. Relevant for a

	guidelines and procedures in line with WGBIOP will also be necessary. Outreach activities will be required.	for dissemination investigated and outreach activities planned.

Summary of the Work Plan

In addition to the ongoing maintenance and improvements by the end of year three we aim to have; the data output and reporting module fully operational, SmartDots maturity staging module fully operational and user manuals updated in line with all developments made.

Year 1	ToR a) and b) will be addressed in quarterly WebEx meetings, with the potential annual meetings intended to coincide with WGBIOP and prioritising ToRs c) and d).
Year 2	ToR a) and b) will be addressed in quarterly WebEx meetings, with the potential annual meetings intended to coincide with WGBIOP and prioritising ToRs c) and d).
Year 3	ToR a) and b) will be addressed in quarterly WebEx meetings, with the potential annual meetings intended to coincide with WGBIOP and prioritising ToRs c) and d).

3 Progress Report

Oversee and advise on the interpretation and prioritization of recommendations and requests addressed to SmartDots (ToR a)

Requests to WGSMART are evaluated during quarterly meetings, entered as issues in GitHub (https://github.com/ices-eg/SmartDots/projects/3) with priorities, labels, responsible people and milestones assigned. These issues constitute the workplan.

Annual feedback and requests are received from the Working Group on Biological Parameters (WGBIOP).

Direct requests were received from the Workshop 2 on the identification of clupeid larvae (WKIDCLUP2), the Workshop on Mackerel, Horse Mackerel and Hake Eggs Identification and Staging (WKMACHIS) and the Workshop on Adult Egg Production Methods Parameters estimation in Mackerel and Horse Mackerel (WKAEPM). Implemented requests lead to the development of an egg and larval identification and a fecundity and atresia module in the web application. Additional requests will be addressed with the development of the ichthyoplankton modules in the software.

Feedback from the SmartDots Feedback webpage (https://smartdots.ices.dk/Userfeedback) are evaluated and incorporated into the GitHub workplan where relevant.

Numerous quick fix issues, (communicated via e-mail) are handled straight away and not always added to GitHub.

A screenshot of the GitHub webpage (https://github.com/ices-eg/SmartDots/projects/3) can be found in Figure 1. To date, 145 issues have already been tackled and closed, 107 issues are still open. The continuous process of receiving and handling numerous new issues, some of which need to be handled as soon as possible has meant that we have outstanding issues with Prioritization 1 which are not being dealt with.
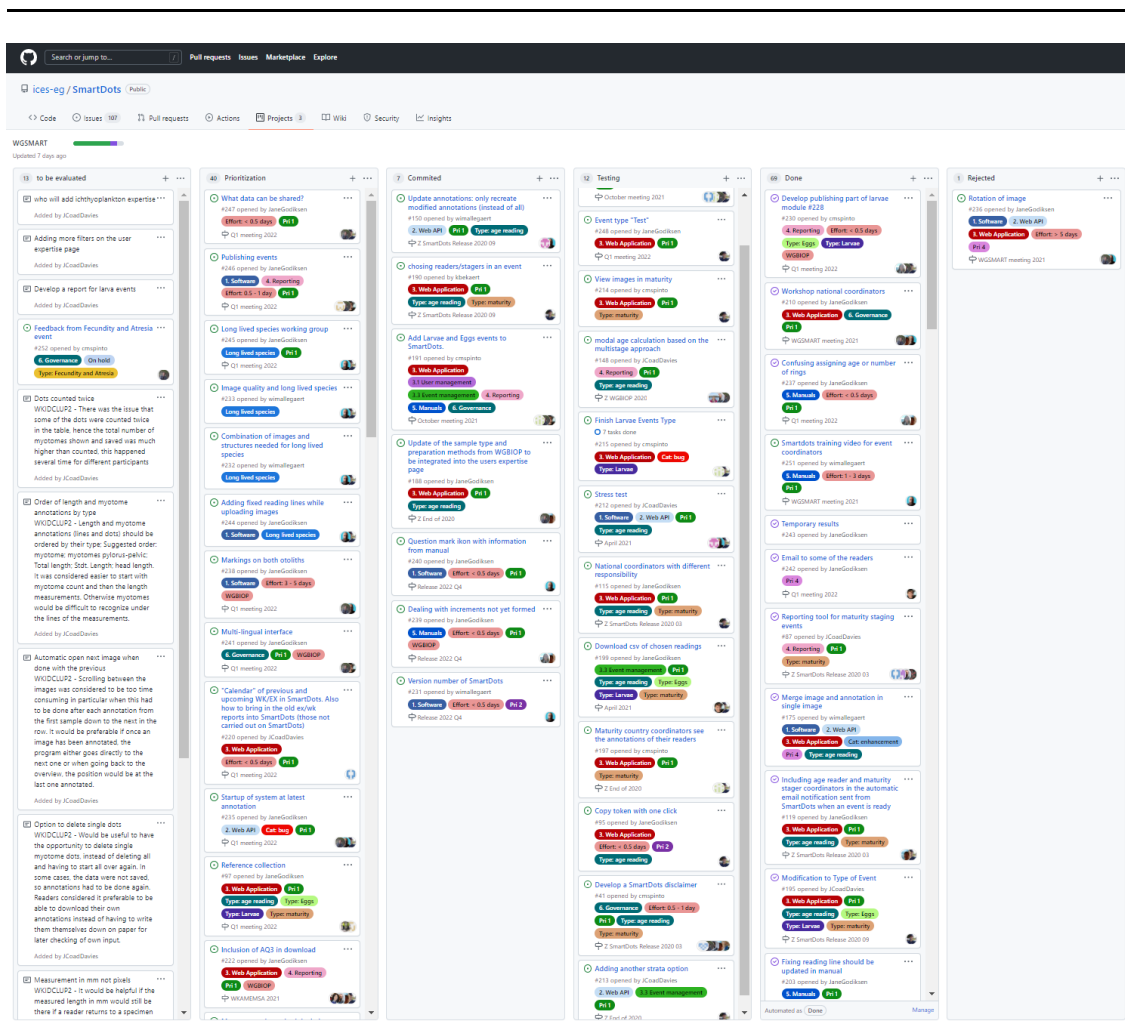
Figure 1. Issue management in GitHub.

Provide a platform for end-user feedback to the SmartDots system (ToR b)

Throughout the last three years feedback was continuously received from the feedback page (https://smartdots.ices.dk/Userfeedback), in the form of e-mail correspondence and unofficial recommendations from WGBIOP coordinated age reading exchanges. The visibility of the page was improved in 2020 and quarterly newsletters promoted its use. All feedback is converted to an issue on the groups GitHub site https://github.com/ices-eg/SmartDots/projects, assigned priorities, assignees, labels for various modules, effort and milestones for completion. This project board is a living work plan, which is updated to coincide with the quarterly progress WebEx meetings.

In addition to the feedback page, we also sent out excel questionnaires to members of WKIDCLUP2, WKMACHIS and WKAEPM to get more specific feedback on the module functions for egg, larvae, fecundity and atresia.

Contact was made to all SmartDots event coordinators (via WGBIOP) reminding participants and coordinators to enter feedback on the page.

Elaborate a forward plan for the sustainability of SmartDots as a platform (ToR c)

A detailed description of required developments to incorporate a maturity staging module, egg and larval identification and fecundity and atresia modules into the software has been written. Included is an outline of the benefits of these developments. Specifications, associated costs and user training needs are detailed. Recommendations have been made to ACOM and the RCG's to support these developments. The Directorate-General for Maritime Affairs and Fisheries (DG MARE) and additional non-EU states have agreed to join in a formal non-recurrent request to ICES to complete this work and the details of this agreement are expected to be finalized by the end of 2021.

WGSMART cooperates with WGBIOP on improving the statistical analysis applied to the age reading data. The implementation of these improvements and the further planning of developments has been hampered by resource availability from the ICES Data Centre. A solution has been reached where the development branch of the code is used to fix errors, make small changes and testing before the code is pushed to the GitHub repository. More significant developments which will require changes to the web application and database will need to be planned and WGSMART hope to reach an agreement with the Data Centre on the frequency of these changes in early 2022.

Oversee development of user guidance and training in SmartDots (ToR d)

Different user manuals are available: one manual for the age reading module in the SmartDots software, destined both for event coordinators and age readers plus three for the web application (one for age reading event coordinators, one for maturity staging event coordinators and one for maturity stagers). User manuals are up to date and available via direct link on the ICES SmartDots landing page (Library (ices.dk)[1]).

An ICES SmartDots YouTube channel has been created with a direct link on the ICES SmartDots landing page (ICES SmartDots - YouTube[2]) to tutorials for the age reading application, web application and maturity staging module.

Following WGBIOP 2020 a request was made to WGSMART to provide further training for event coordinators in the form of a workshop or online training events. After an evaluation of the request and looking into the various approaches that could be taken in consideration of both COVID-19 and practicalities, WGSMART decided that online tutorials were the best approach and that these tutorials could be made available on the SmartDots YouTube channel. Many age

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[1] https://www.ices.dk/publications/library/Pages/default.aspx?#k=Title%3Asmartdots%2C%20owstaxIdPublication-Type%3AUser%20handbooks

[2] https://www.youtube.com/channel/UCa4bjXo-eBDfW0cm1oEIWeQ/playlists?app=desktop&cbrd=1

and maturity stager national coordinators attend WGBIOP and thus a tutorial session was planned for the WGBIOP 2021 online meeting, where all national coordinators (including non WGBIOP members) were invited to attend. The tutorial covered 3 themes; set up an event, report on an event and an explanation of the report. Steps outlined included; how to download the handbook, propose an event, complete and verify the sample upload file, upload samples and images, add readers, set image scale, defining what properties should be shown in the software, defining strata and readers for the report, report extraction and how to publish an event. The report content and relevant statistics were explained in detail. The tutorial was recorded via Microsoft Teams, has been edited to ensure all GDPR regulations are followed and has been posted on the SmartDots YouTube channel. A link will be sent to all age and maturity stager national coordinators listed in the SmartDots database and feedback will be requested via the feedback website.

Following the recommendation from WGBIOP in 2019, WGSMART have agreed that it is the responsibility of the national age reader and maturity stager coordinators to train their readers and stagers with the material provided by WGSMART.

In 2021, WGSMART proposed and organized a workshop (WKAMEMSA) to include event and national coordinators, stock assessors and model developers. The focus was on the development of a suitable report output which can be applied to the most widely used models in the assessment working groups.

Annex 1: List of participants

2021 Meeting

Name	Institute	Country (of institute)	E-mail	Particpated in meeting				
				11 Jan	11 May	2 Sept	12 Oct	24-25 Nov
Adrian Tait	Marine Scotland Science	Scotland	Adrian.Tait@gov.scot	x	x	x	x	x
Alfonso Rodrigues-Perez	Institute of Marine Research	Norway	alfonso.perez.rodriguez@hi.no	x	x	x		x
Annelie Hilvarsson	SLU Department of Aquatic Resources-SLU Aqua	Sweden	annelie.hilvarsson@slu.se	x	x	x	x	x
Audur Susanne Bjarnadottir	Marine and Freshwater Research Institute (MFRI)	Iceland	audur.bjarnadottir@hafogvatn.is			x		
Carlos Pinto	International Council for the Exploration of the Sea	Denmark	carlos@ices.dk	x	x	x	x	x
Cindy van Damme	Wageningen University & Research	Netherlands	cindy.vandamme@wur.nl	x				
Gudrun Finnbogadóttir	Marine and Freshwater Research Institute (MFRI)	Iceland	gudrun.finnbogadottir@hafogvatn.is			x	x	x
Jane Aanestad Godiksen	Institute of Marine Research	Norway	jane.godiksen@hi.no	x	x	x	x	x
Joana Ribeiro	International Council for the Exploration of the Sea	Denmark	joana.ribeiro@ices.dk	x	x		x	x

Julie Davies	DTU-Aqua	Denmark	joco@aqua.dtu.dk	x	x	x	x	x
Karen Bekaert	Institute for Agricultural and Fisheries Research (ILVO)	Belgium	karen.bekaert@ilvo.vlaanderen.be	x	x	x	x	x
Mandy Gault	Marine Scotland Science	Scotland	M.Gault@marlab.ac.uk	x	x	x		
Maria Cristina Follesa	University of Cagliari	Italy	follesac@unica.it		x			
Patrícia Goncalves	Portuguese Institute for the Sea and the Atmosphere (IPMA)	Portugal	patricia@ipma.pt	x	x	x		x
Sigurvin Bjarnason	Marine and Freshwater Research Institute (MFRI)	Iceland	sigurvin.bjarnason@hafogvatn.is			x		
Ulrika Beier	Wageningen University & Research	Netherlands	Ulrika.beier@wur.nl		x	x	x	x
Wim Allegaert	Institute for Agricultural and Fisheries Research (ILVO)	Belgium	wim.allegaert@ilvo.vlaanderen.be	x	x		x	x

2020 Meeting

Name	Institute	Country (of institute)	E-mail	Participated in meeting					
				14 Jan	21 Apr	12 May	8 Sep	23 Oct	26 Nov
Julie Davies	DTU-Aqua	Denmark	joco@aqua.dtu.dk	x	x	x	x	x	x
Jane Aanestad Godiksen	Institute of Marine Research	Norway	jane.godiksen@hi.no		x	x	x	x	x
Annelie Hilvarsson	SLU Department of Aquatic Resources-SLU Aqua	Sweden	annelie.hilvarsson@slu.se	x	x	x	x	x	x
Karen Bekaert	Institute for Agricultural and Fisheries Research (ILVO)	Belgium	karen.bekaert@ilvo.vlaanderen.be	x	x	x	x	x	x
Wim Allegaert	Institute for Agricultural and Fisheries Research (ILVO)	Belgium	wim.allegaert@ilvo.vlaanderen.be	x	x	x	x	x	x
Carlos Pinto	International Council for the Exploration of the Sea	Denmark	carlos@ices.dk	x	x	x	x	x	x
Maria Cristina Follesa	University of Cagliari	Italy	follesac@unica.it		x	x			x
Patrícia Goncalves	Portuguese Institute for the Sea and the Atmosphere (IPMA)	Portugal	patricia@ipma.pt	x	x	x	x	x	x
Alfonso Rodrigues-Perez	Institute of Marine Research	Norway	alfonso.perez.rodriguez@hi.no	x		x	x	x	x
Ulrika Beier	Wageningen University & Research	Nederlands	Ulrika.beier@wur.nl	x	x	x	x		x

Els Torreele	Institute for Agricultural and Fisheries Research (ILVO)	Belgium	els.torreele@ilvo.vlaanderen.be					x
Adrian Tait	Marine Scotland Science	Scotland	Adrian.Tait@gov.scot					x
Joana Ribeiro	International Council for the Exploration of the Sea	Denmark	joana.ribeiro@ices.dk		x	x	x	x
Rui Catarino	International Council for the Exploration of the Sea	Denmark	rui.catarino@ices.dk	x		x		
Cindy van Damme	Wageningen University & Research	Nederlands	cindy.vandamme@wur.nl	x		x	x	

2019 Meeting

Name	Institute	Country (of institute)	E-mail
Alfonso Perez-Rodriguez	IMR	Norway	alfonso.perez-rodriguez@hi.no
Annelie Hilvarsson	SLU	Sweden	annelie.hilvarsson@slu.se
Carlos Pinto	ICES	Denmark	Carlos@ices.dk
Els Torreele	ILVO	Belgium	els.torreele@ilvo.vlaanderen.be
Jane Aanestad Godiksen	IMR	Norway	jane.godiksen@hi.no
Julie Olivia Coad Davies	DTU Aqua	Denmark	joco@aqua.dtu.dk
Karen Bekaert	ILVO	Belgium	Karen.Bekaert@ilvo.vlaanderen.be
Kevin DeCoster	ILVO	Belgium	Kevin.DeCoster@ilvo.vlaanderen.be
Loes Bolle	IMARES	The Netherlands	loes.bolle@wur.nl
Maria Cristina Follesa	UNICA	Italy	follesac@unica.it
Neil Holdsworth	ICES	Denmark	NeilH@ices.dk
Patricia Gonçalves	IPMA	Portugal	patricia@ipma.pt
Rui Catarino	ICES	Denmark	rui.catarino@ices.dk
Wim Allegaert	ILVO	Belgium	wim.allegaert@ilvo.vlaanderen.be

Annex 2:   Resolutions

2018/MA2/EOSG01   The **Working Group on SmartDots Governance** (WGSMART), co-chaired by Julie Coad Davies* (Denmark) and Jane Aanestad Godiksen* (Norway), will meet intersessionally, 4 times per year via WebEx and may meet physically once per year, to work on ToRs and generate deliverables as listed in the Table below.

	WEBEX Meeting dates	**Meeting dates and Venue**	**Reporting details**	**Comments (change in Chair, etc.)**
Year 2019	1) 7 February 2) 25 April 3) 12 September 4) 14 November	11-12 October Venue as WGBIOP	Interim report by TBD to EOSG	
Year 2020	1) 14 January 2) 21 April 3) 8 September 4) 17 November 10-12am (CPH time)	5-6 October Venue as WGBIOP	Interim report by TBD to EOSG	Agreed upon at WGSMART October 2019 meeting that WGSMART will meet on the Monday before WGBIOP 2020 and proposes that the first day of WGBIOP is dedicated to overlapping work of WGSMART and WGBIOP
Year 2021	1) 12 January 2) 20 April 3) 7 September 4) 16 November	8-9 October Venue as WGBIOP	Final report by TBD to EOSG	If the approach taken in 2020 works then this will be followed in 2021

WGSMART will report on its activities by the March SCICOM meeting the following year to EOSG and DIG.

ToR descriptors

ToR	Description	Background	Science Plan codes	Duration	Expected Deliverables
a	Oversee and advise on the interpretation and prioritisation of recommendations and requests addressed to SmartDots	SmartDots is an operational tool that aims to improve the overall quality of age data delivered to assessment EG's. The tool is now operational and an integral part of the ICES QAQC for aging many fish species for which ICES provides advice, procedure largely under the guidance of WGBIOP. However maintenance and future development of the platform are beyond the scope of the scientific WG's and WK's.		3 years/ Generic ToR	A prioritised list of SmartDots related expert group recommendations with a proposed annual work plan to address concerns and implement improvements to SmartDots.

b	Provide a platform for end user feedback to the SmartDots system. User feedback will be requested from the end users via the GitHub site, exchange/workshop reports, EG'S and committes. Feeback will be compiled by WGSMART and appropriate actions to be taken with assigned responsibilities will be listed and prioritised.	SmartDots will be further developed to meet the requirements of a broad range of end users and thus needs to be responsive to user feedback. This feedback system needs to be independent of WGBIOP as a greater responsiveness (more than one meeting a year) is required to manage the system effectively.	3 years/Generic ToR	
c	Elaborate a forward plan for the sustainability of SmartDots as a platform	To achieve a continous quality, SmartDots needs to be developed in line with end users needs. This development requires an input of resources; knowledge, expertise, manpower and funding over a period of time which extends beyond the initial phase. A workplan with clear objectives and milestones can only be sucessfully implemented when the availability of such resources is clear.	3 years/ Generic ToR	A workplan outlining what resources are required for development, support, training and dissenimation of relevant information. An estimated budget including identified funding resouces.
d	Oversee development of user guidance and training in SmartDots	As SmartDots develops over-time a range of users will require various levels of training including step by step user manuals, tutorials and possibly workshops. Documentation of guidelines and procedures in line with WGBIOP will also be necessary. Outreach activities will be required.	3 years/ Generic ToR	Annually updated training documentation. Workshops with specific goals proposed and planned where necessary. Relevant fora for dissemination investigated and outreach activities planned.

Summary of the Work Plan

In addition to the ongoing maintenance and improvements by the end of year three we aim to have; the data output and reporting module fully operational, SmartDots maturity staging module fully operational and user manuals updated in line with all developments made.

Year 1	ToR a) and b) will be addressed in quarterly WebEx meetings, with the potential annual meetings intended to coincide with WGBIOP and prioritising ToRs c) and d).
Year 2	ToR a) and b) will be addressed in quarterly WebEx meetings, with the potential annual meetings intended to coincide with WGBIOP and prioritising ToRs c) and d).
Year 3	ToR a) and b) will be addressed in quarterly WebEx meetings, with the potential annual meetings intended to coincide with WGBIOP and prioritising ToRs c) and d).

Supporting information

Priority	
Resource requirements	A commitment of time from the members of the group consistent with progressing actions identified in the quarterly meetings
Participants	Chair of WGBIOP, one member from each country from the core development group (BE, DK, NO), ICES Secretariat as hosts of International SmartDots, other WGBIOP members as need be
Secretariat facilities	Community Sharepoint site, Remote meeting facilities
Financial	No financial implications
Linkages to ACOM and groups under ACOM	This is an integral component to the overall Quality Assurance framework (of Advice) that ACOM together with the Coordination group are describing
Linkages to other committees or groups	There is a very close working relationship with WGBIOP. There is a strong linkage to DIG as the main umbrella for data/software governance structures.
Linkages to other organizations	EU Commission has partially funded SmartDots and is therefore following its progress, GFCM in the Mediterranean also has interest in this system