

ICES WGVHES REPORT 2018

HUMAN ACTIVITIES, PRESSURES AND IMPACTS STEERING GROUP

ICES CM 2018/HAPISG:15

REF. SCICOM

Report of the Working Group on the Value of Coastal Habitats for Exploited Species (WGVHES)

25–29 June 2018

ICES Headquarters, Copenhagen, Denmark



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International Council for
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International Council for the Exploration of the Sea Conseil International pour l'Exploration de la Mer

H. C. Andersens Boulevard 44–46
DK-1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

Recommended format for purposes of citation:

ICES. 2018. Report of the Working Group on the Value of Coastal Habitats for Exploited Species (WGVHES), 25–29 June 2018, ICES Headquarters, Copenhagen, Denmark. ICES CM 2018/HAPISG:15. 17 pp.

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Contents

Executive summary	2
1 Administrative details	3
2 Terms of Reference a) – z)	3
3 Summary of Work plan	3
4 Summary of Achievements of the WG during 3-year term	4
5 Final report on ToRs, workplan and Science Implementation Plan	6
5.1 ToR a) Synthesize available information for quantifying the value of coastal habitat for exploited species including an ecosystem service perspective.....	6
5.2 ToR b) Demonstration of the importance of habitats for exploited species on regional scales using modelling and case study approaches.....	6
5.3 ToR c) Characterize the relation between habitat, individual processes and population responses.....	7
5.4 ToR d) Investigate how habitat considerations can be incorporated into quantitative tools used in the management process.....	8
5.5 Science highlights	9
6 Cooperation	9
7 Summary of Working Group self-evaluation and conclusions	9
Annex 1: List of participants.....	10
Annex 2: Recommendations.....	12
Annex 3: WGVHES draft resolution 2019–2021.....	13
Annex 4: WGVHES self-evaluation.....	15

Executive summary

This report summarizes the work of the ICES Working Group on the Value of Coastal Habitats for Exploited Species (WGVHES) from 2016 to 2018 (27 June–1 July 2016, Amsterdam, The Netherlands; 26–30 June 2017, Valetta, Malta; 25–29 June 2018, Copenhagen, Denmark); participants included scientists within the fields of modelling, marine ecology, fishery management, and conservation biology.

The primary goal of this working group was to identify anthropogenic impacts on habitats for different life stages of exploited species, for which ICES gives management advice. Further, our goals included an evaluation of modelling approaches to quantify habitat quality for populations of exploited species, and a demonstration of the importance of hard-bottom habitats for ICES species. A paper was published about human impacts on commercially important fish species utilizing coastal habitat (Brown *et al.* ICES JMS 2018). The main findings were that 92% of ICES species are impacted by human activity in at least one life history stage while utilizing coastal habitat and 38% in multiple stages. Anthropogenic pressures most commonly shown to impact these fish species were toxicants and pollutants (75% of species). Eutrophication and anoxia, invasive species, and physical coastal development affected about half of the species (58, 54, and 42% of species, respectively), while indirect fishing impacts affected a minority (17% of species). Moreover, 71% of the ICES advice species that utilize coastal habitats face impacts from more than one pressure, implying cumulative effects. A second paper is nearly ready for submission that reviews quantitative modelling approaches for integrating habitat quality into population models (Lipcius *et al.*, in prep). This paper uses examples to demonstrate incorporation of habitat into state variable, structured and individual-based modelling approaches. A third paper (Flavio *et al.*, in prep) systematically reviewed the literature on hard-bottom habitats. It found that the role of hard-bottom habitats in influencing density and biodiversity of fishery species has been well described, but that relatively few studies documented how demographic rates vary among habitat types. Artificial structures such as de-commissioned oil rigs and the base of wind turbines can have positive effects on demersal fish species.

Overall, our work demonstrates the importance of habitat considerations for exploited species, but highlights significant gaps in knowledge. We conclude that it would be useful to expand our working group activities in a) defining the nursery habitat concept; b) understanding the reliance of commercially important species on hard bottom and biogenic habitats; c) documenting lessons learned on conservation of habitat; and d) using information from juvenile abundance indices in management.

1 Administrative details

<p>Working Group name Working Group on Value of Coastal Habitat for Exploited Species</p> <p>Year of Appointment within current cycle 2016</p> <p>Reporting year within current cycle (1, 2 or 3) 3</p> <p>Chair(s) Rochelle Seitz, US Josianne Støttrup, Denmark Karen van de Wolfshaar, The Netherlands</p> <p>Meeting venue(s) and dates 27 June–1 July 2016, Amsterdam, The Netherlands (12 participants) 26–30 June 2017, Valletta, Malta (11 participants) 25–29 June 2018, Copenhagen, Denmark (14 participants)</p>
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2 Terms of Reference a) – z)

- a) Synthesize available information for quantifying the value of coastal habitat for exploited species including an ecosystem service perspective.
- b) Demonstration of the importance of habitats for exploited species on regional scales using modelling and case study approaches.
- c) Characterize the relation between habitat, individual processes and population responses.
- d) Investigate how habitat considerations can be incorporated into quantitative tools used in the management process.

3 Summary of Work plan

Year 1	Finalize project from the previous period under ToR a and start projects under ToR b and ToR c.
Year 2	Continue work from ToR b and ToR c and start on ToR d.
Year 3	Finalize science deliveries and identify future research priorities.

4 Summary of Achievements of the WG during 3-year term

Publications (bold denotes members of the working group)

- Van de Wolfshaar KE, Tulp I, Wennhage H & Støttrup JG.** 2015. Modelling population effects of juvenile offshore fish displacement towards adult habitat. *MEPS* 540: 193–201.
- Le Pape, O.,** N. Cognez. 2016. The range of juvenile movements of estuarine and coastal nursery dependent flatfishes: estimation from a meta-analytical approach. *Journal of Sea research*: 107(1): 43–55.
- Theuerkauf, S.J. and **R.N. Lipcius.** 2016. Quantitative validation of a habitat suitability index for oyster restoration. *Frontiers in Marine Science* 3:64, doi: 10.3389/fmars.2016.00064, 9 pp.
- Seitz, R.D., R.N. Lipcius,** and A.H. Hines. 2016. Consumer versus resource control and the importance of habitat heterogeneity for marine bivalves. *Oikos* 126: 121–135 doi: 10.1111/oik.03330
- Post, M.,** E. Blom, C. Chen. L. J. Bolle, M.J. 2017. Habitat selection of juvenile sole (*Solea solea* L.): Consequences for shoreface nourishment. *Journal of Sea Research* 122: 19–24. doi: 10.1016/j.seares.2017.02.011
- Colloca, F.,** Scarcella, G., & Libralato, S. (2017). Recent Trends and Impacts of Fisheries Exploitation on Mediterranean Stocks and Ecosystems. *Frontiers in Marine Science*, 4, 244.
- Kraufvelin, P., Z. Pekcan-Hekim, **U. Bergström,** A.-B. Florin, A. Lehikoinen, J. Mattila, T. Arula, L. Briekmane, **E. J. Brown,** Z. Celmer, J. Dainys, H. Jokinen, P. Kääriä, M. Kallasvuo, A. Lapalainen, L. Lozys, P. Möller, A. Orio, M. Rohtla, L. Saks, M. Snickars, **J. Støttrup,** G. Sundblad, I. Taal, D. Ustups, A. Verliin, M. Vetemaa, H. Winkler, A. Wozniczka, and J. Olsson. 2018. Essential coastal habitats for fish in the Baltic Sea. *Estuarine, Coastal and Shelf Science*, 204: 14–30.
- Brown, E. J., R. P. Vasconcelos, H. Wennhage, U. Bergström, J. G. Støttrup, K. E. van de Wolfshaar, G. Millisenda, F. Colloca, O. le Pape.** 2018. Conflicts in the coastal zone: Human impacts on commercially important fish species with coastal habitat use. *ICES Journal of Marine Science*, fsx237, doi: 10.1093/icesjms/fsx237.
- Kroll, I., A. Poray, B. Puckett, **D. Eggleston, J. Fodrie.** 2018. Estuarine-scale larval connectivity of oysters within a large, wind-driven system. *Limnology & Oceanography*. In Press.

In preparation

- R. N. Lipcius, D. B. Eggleston, F. J. Fodrie, J. van der Meer, K. A. Rose, R. P. Vasconcelos, K. E. van de Wolfshaar.** Modelling quantitative value of coastal habitats for exploited populations. To be submitted to *Frontiers in Marine Science*. The final draft is being commented on by the co-authors.
- Hugo Flávio, Rochelle D. Seitz, Dave B. Eggleston, Jon C. Svendsen, Josianne G. Støttrup.** Evidence that hard-bottom habitats support commercially important fish species: a systematic review for the North Atlantic Ocean and Baltic Sea. Draft being edited for submission to *ICES JMS* 2018

Presentations

- Støttrup JG,** Thomas K. Sørensen, Josefine Egekvist, **Elliot E. Brown,** Grete, E. Dinesen, Frank I. Hansen and Morten Vinther. 2016. Multidisciplinary mapping of fish habitats in the Sound,

Denmark for maritime spatial planning. WKCCMSP, Geesthacht, Germany, 8–12 February 2016.

- Støttrup JG**, Thomas K. Sørensen, Josefine Egekvist, **Elliot E. Brown**, Grete, E. Dinesen, Frank I. Hansen and Morten Vinther. 2016. Multidisciplinary mapping of fish habitats in the Sound, Denmark for maritime spatial planning. HELCOM, Riga, Latvia, 16–18 February, 2016.
- Rivot, E., B. Archambault, S. Rochette, Y. Vermard, M. Savina-Rolland, and **O. Le Pape**. 2016. Modelling the life cycle of nursery-dependent fish species. Hierarchical Bayesian Models for a synthesis of different pieces of knowledge and data sources. Communication. International Statistical Ecology Conference - 28th June - 1st July 2016 – Seattle, USA.
- Seitz, R.D.**, D.B. Breitburg, M. Kornis, D. Prosser. 2016. Landuse and shoreline effects on Chesapeake Bay animals: benthos, fish, and waterbirds. Maryland Association for Environmental and Outdoor Education, Ocean City, MD, February. Invited presentation.
- Brown, E. J., R. P. Vasconcelos, H. Wennhage, U. Bergström, J. G. Støttrup, K. van de Wolfshaar, G. Millisenda, F. Colloca, O. le Pape**. 2017. Conflicts in the coastal zone: Human impacts on commercially important fish species with coastal habitat use. HELCOM FISH-PRO II 4–2017. Tallinn, Estonia, at the premises of the Ministry of the Environment. 14 February 2017.
- Le Pape, O.**, B. Archambault, L. Baulier, M. Savina, S. Rochette, Y. Vermard, S. Lehuta, M. Véron, M. Randon, W. Hunter, H. du Pontavice, E. Réveillac, and E. Rivot. 2017. Life-cycle connectivity of an exploited marine fish: implications for (sub)population dynamics and management impacts. Keynote speaker. 3rd international marine connectivity conference (iMarCo2017), 11–13 septembre 2017, Louvain (Belgium).
- Lipcius, R. N.**, Colden, A. M., Bachand, K. E. 2017. Eastern oyster reefs facilitate seagrass beds. National Shellfisheries Association Meeting.
- Post, M.** 2017. Effects of (mega)nourishment on juvenile flatfish distribution in the shallow coastal zone. Nature Coast End symposium, Delft, 9th May 2017.
- Seitz, R.D.**, K.E. Knick, and C. Harris. 2017. Effects of habitat complexity and oyster density on survival and community structure in Chesapeake Bay. Coastal and Estuarine Research Federation Bi-Annual meeting, Providence, RI. November.
- Støttrup, J.** 2017. Essential Fish Habitats. EU parliament event on Restoring fish abundance by protecting Essential Fish Habitats. Brussels, June 1st, 2017.
- Lipcius, R.N.**, Chei, E. 2018. Food web and habitat use of oyster reefs by the blue crab in Chesapeake Bay. National Shellfisheries Association Meeting.

5 Final report on ToRs, workplan and Science Implementation Plan

5.1 ToR a) Synthesize available information for quantifying the value of coastal habitat for exploited species including an ecosystem service perspective

Under ToR a), one paper was published in the primary literature.

Brown, E.J., Vasconcelos, R.P., Wennhage, H., Bergström, U., Støttrup, J.G., Wolfshaar van de, K., Millisenda, G., Colloca, F., Le Pape, O. 2018. Conflicts in the coastal zone: Human impacts on commercially important fish species utilizing coastal habitat. *ICES Journal of Marine Science*. <https://doi.org/10.1093/icesjms/fsx237>

Coastal ecosystems are ecologically, culturally, and economically important, and hence are under pressure from diverse human activities. We reviewed the literature for existing evidence of effects of human-induced habitat changes on exploited fish utilizing coastal habitats. We focused on fish species of the Northeast Atlantic for which fisheries advice is provided by International Council for the Exploration of the Sea (ICES) and which utilize coastal habitats for at least one life-history stage (LHS). We found that 92% of these species are impacted by human activity in at least one LHS while utilizing coastal habitat and 38% in multiple stages. Anthropogenic pressures most commonly shown to impact these fish species were toxicants and pollutants (75% of species). Eutrophication and anoxia, invasive species, and physical coastal development affected about half of the species (58, 54, and 42% of species, respectively), while indirect fishing impacts affected a minority (17% of species). Moreover, 71% of the ICES advice species that utilize coastal habitats face impacts from more than one pressure, implying cumulative effects. Given that three-fourths of the commercial landings come from fish species utilizing coastal habitats, there is an obvious need for a better understanding of the impacts that human activities cause in these habitats for the development of ecosystem-based fisheries management.

5.2 ToR b) Demonstration of the importance of habitats for exploited species on regional scales using modelling and case study approaches

Under ToR b), work was focused on one review, which is near completion. This work is close to being submitted.

Review of quantitative modelling approaches for integrating habitat quality into population models

Participants: Romuald N. Lipcius, David B. Eggleston, F. Joel Fodrie, Jaap van der Meer, Kenneth A. Rose, Rita P. Vasconcelos and Karen E. van de Wolfshaar.

Although the influence of coastal habitats on survival, growth, and reproduction of exploited marine species has been demonstrated widely, the absolute value of these habitats to their population dynamics has rarely been quantified. Consequently, it has been difficult to estimate the optimal extent of habitat required for the persistence and sustainable use of exploited species, and therefore, to effectively manage habitat with respect to abundance of exploited species. We used examples to demonstrate incorporation of habitat into state variable, structured and individual-based modelling approaches. Our analyses illustrated methodologies for incorporating habitat into models and demonstrated intuitive (predictable) and non-linear (including counter-intuitive) population responses

to habitat change. We outlined several promising approaches that combine various modelling methods together in order to provide quantitative predictions of habitat effects on the population dynamics of exploited species.

5.3 ToR c) Characterize the relation between habitat, individual processes and population responses

There was progress during the three-year time frame on using Dynamic Energy Budget (DEB) models. One WGVHES member, Marjolein Post, finished a PhD with a component on the topic of DEB models and a manuscript is underway with another WGVHES member, Karen van de Wolfshaar:

Post, M.H.M., Baptist, M.J., Gerla, D., Teal, L., Wolfshaar, van de K.E. "Sand nourishment effects on juvenile plaice (*Pleuronectes platessa* L.) growth".

Abstract

Sand nourishments are a critical part of coastal zone management along the Dutch coast. Nourishments are an effective strategy against coastal erosion but will likely affect essential nursery conditions for juvenile fish through changes in resource abundance. Benthic prey are immediately killed by burial after nourishment, resulting in lower food availability for juvenile flatfish. The associated changes in benthic productivity following a nourishment can be directly related to changes in juvenile fish growth with the application of a Dynamic Energy Budget (DEB) model, allowing a mechanistic approach to nourishment effects on flatfish through prey availability. The model was applied to juvenile plaice (*Pleuronectes platessa* L.), an important commercial species in the North Sea. We present the results of different nourishment timing scenarios, benthic regrowth rates and their effect on temperature-dependent growth of juvenile flatfish. Growth changes after a nourishment were predicted with modelled temperature and food conditions, allowing us to extrapolate the effects of the impact on the benthic prey to higher trophic levels. Growth rates decreased after a nourishment event, with the largest impact during the growing season of juvenile plaice. The achieved length at the end of the growing season depended on the benthic productivity recovery rate. Average recovery caused a maximum decrease of ~1.8 cm, whereas low recovery resulted in a maximum length difference of ~5.1 cm. Low benthic recovery can result in a dramatic increase of winter mortality risk. Our model provides a predictive approach to explore the effects of different nourishment strategies on fish growth and provides a physiological basis for a more ecologically friendly nourishment approach.

There was significant progress on the systematic review of hard-bottom habitats. A manuscript has been drafted:

Hugo Flávio, Rochelle D. Seitz, Dave B. Eggleston, Jon C. Svendsen, Josianne G. Støttrup. Evidence that hard-bottom habitats support commercially important fish species: a systematic review for the North Atlantic Ocean and Baltic Sea. Draft being edited for submission to ICES JMS 2018.

In a systematic literature review of hard bottom habitats, the majority of papers described the role of hard-bottom habitats on density and biodiversity of fishery species, with relatively few identifying how demographic rates vary among habitat types. Artificial struc-

tures such as de-commissioned oil rigs and the base of wind turbines can have positive effects on demersal fish species.

5.4 ToR d) Investigate how habitat considerations can be incorporated into quantitative tools used in the management process

The working group address the following topics identified during the 2017 meeting:

(i) Evaluation and revision of current quantitative definitions of nursery habitat by accumulating publications dealing with the nursery habitat concept to be evaluated during the 2018 meeting.

The group reviewed the literature on the quantitative definitions of nursery habitat. It was concluded that there has been sufficient discussion of the nursery habitat concept over the past two decades, and that another publication on the concept per se is not warranted. However, it was noted that the definition of nursery value has become increasingly complex even though there is limited empirical evidence that the original definition is insufficient and it is already difficult to apply in practice. The group will therefore conduct a review of applications of the nursery habitat concept in management and conservation to determine if the concept as currently defined has been useful in management and conservation. A section of the review will be dedicated to refinement of the nursery habitat concept, if necessary, with recommendations for its application in fisheries management.

(ii) Review of Recruit-Stock relationships for ICES species for which there are stock assessment reports [and selected species not managed by ICES] by accumulating available data from stock assessments.

The group investigated the link between juvenile abundance for coastal nursery dependent species and future recruitment in the stocks, and the interest to integrate juvenile abundance indices in short term forecasts to improve advice in stock assessment. The goals are to address: (1) What is the frequency of the use of juvenile abundance indices in recruitment forecasts in the framework of stock assessment groups (and what are the drivers of and the barriers to this use)? (2) When juvenile abundance indices are used, what is the level of accuracy in recruitment forecasts, and what are the drivers of this level of accuracy?

Analyses are ongoing. To date, over the 185 ICES stocks have been examined. Of these, 78 were determined to be dependent on coastal nursery areas, spanning 18 ICES assessed species. A questionnaire was circulated and completed by scientists who lead assessments for the 78 stocks. Among these 78 stocks, a large majority (78%) concern well-assessed stocks (DLS categories 1 and 3). Of the 63 well-assessed stocks, 50 use forecasts to help decision making in stock management advice. Juvenile abundance indices are available for 75% of the 50 well-assessed stocks for which assessment is associated with forecasts. These juvenile indices are used to forecast sustainable allowable catch for less than 40% of the stocks for which they are available.

Further investigations are needed to (1) determine the factors that influence when juvenile indices are used, from further inquiries addressed to the stock leader scientists; (2) analyse the accuracy of future recruitment prediction from juvenile indices; (3) quantify whether the use of juvenile indices improve the accuracy of TAC estimates; and (4) estab-

lish the drivers that influence any gains in accuracy (e.g., species life history traits, scale of the survey, focus of the survey on coastal nurseries).

(iii) Development of a framework for incorporating nursery habitat into ICES management decisions

In order to achieve this objective, the group added a management focus to the previous two objectives and formulated a new ToR (C) for 2019–2021 that will collate lessons learned from experiences of essential fish habitat designation to support future management decisions.

5.5 Science highlights

The group paper on “Conflicts in the coastal zone: human impacts on commercially important fish species utilizing coastal habitat”, published January 2018 (ICES JMS), was well received and viewed over 100 times from Research Gate in the first months. The paper’s main finding is that 92% of exploited species are impacted by human activity in at least one life history stage (LHS) while utilizing coastal habitat and 38% in multiple stages. Anthropogenic pressures most commonly shown to impact these fish species were toxicants and pollutants (75% of species). Given that 75% of the commercial landings come from fish species utilizing coastal habitats, there is an obvious need for a better understanding of the impacts that human activities cause in these habitats for the development of ecosystem-based fisheries management.

J. Støttrup was invited to give a presentation in June 2017 at the European Parliament on “Restoring fish abundance by protecting essential fish habitats”. The aim of the event was to discuss progress on the protection of essential fish habitats under Article 8 of the EU Common Fisheries Policy and its contribution to rebuilding European fish stocks by 2020.

6 Cooperation

The working group did not cooperate with other ICES working groups.

7 Summary of Working Group self-evaluation and conclusions

One group paper was published and two are in their final stage before submission to a scientific journal. Papers were published by group members that benefitted from their membership of the group. One ToR was completed and significant progress was made on the other three ToRs. The working group wants to expand its activities to better quantify habitat value and evaluate its use in management. Members fulfilled relevant advisory roles on habitat aspects. Group members are advising national governments (France, Denmark, USA) on application of habitat considerations in fisheries management. J. Støttrup was invited to inform the European Parliament about progress on the protection of essential fish habitats.

Annex 1: List of participants

NAME	INSTITUTE	EMAIL
David Eggleston	Center for Marine Sciences and Technology, North Carolina State University, 303 College Circle, Morehead City, NC 28557 USA	eggleston@ncsu.edu
Romuald Lipcius	Virginia Institute of Marine Science, College of William & Mary, P.O. Box 1346, Gloucester Point, VA 23062 USA	rom@vims.edu
Rochelle Seitz	Virginia Institute of Marine Science, College of William & Mary, P.O. Box 1346, Gloucester Point, VA 23062 USA	seitz@vims.edu
Josianne Støttrup	National Institute of Aquatic Resources, Technical University of Denmark, Charlottenlund, Denmark	jgs@aqua.dtu.dk
Karen van de Wolfshaar	Wageningen Marine Research, Haringkade 1, IJmuiden, The Netherlands	karen.vandewolfshaar@wur.nl
Elliot Brown	DTU Aqua - National Institute of Aquatic Resources	elbr@aqua.dtu.dk
Rita Vasconcelos	MARE - Marine and Environmental Sciences Centre. Faculdade de Ciências, Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal	rpvasconcelos@fc.ul.pt
Håkan Wennhage	Swedish Board of Fisheries, Institute of Marine Research, Lysekil Turistgatan 5 P.O. Box 4, 453 21 Lysekil, Sweden	hakan.wennhage@fiskeriverket.se
Olivier Le Pape	Agrocampus Ouest, UMR985 ESE Ecologie et santé des écosystèmes, F-35042 Rennes, France;	olivier.le.pape@agrocampus-ouest.fr
Kenny Rose	University of Maryland Center for Environmental Science, Horn Point Laboratory, PO Box 775, Cambridge, Maryland USA	krrose@lsu.edu
Andreas Dänhardt	Institute of Hydrobiology and Fishery Science	andreas.daenhardt@uni-hamburg.de
Ulf Bergström	Institute of Coastal Research	ulf.bergstrom@slu.se
Marjolein Post	Wageningen Marine Research, Haringkade 1, IJmuiden, The Netherlands	marjolein.post@wur.nl
Jaap van der Meer	Royal Netherlands Institute for Sea Research	Jaap.van.der.Meer@nioz.nl

Francesco Colloca	Institute for Coastal Marine Environment	francesco.colloca@iamc.cnr.it
Hugo Flávio	DTU Aqua - National Institute of Aquatic Resources	hdmfla@aqua.dtu.dk
Giacomo Millisenda	Institute for Coastal Marine Environment	giacomo.milisenda@iamc.cnr.it
Benjamin Ciotti	University of Plymouth	Benjamin.ciotti@plymouth.ac.uk
Pierre Thiriet	UMS PatriNat – French National Museum of Natural History – Dinard Marine Station	pierre.thiriet@mnhn.fr
Joel Fodrie	Institute of Marine Sciences, University of North Carolina at Chapel Hill, Morehead City, North Carolina, USA	jfodrie@unc.edu



Participants 2018 of the ICES working group on the value of coastal habitats for exploited species in Copenhagen, Denmark: Benjamin Ciotti, Hugo Flávio, Rom Lipcius, Olivier Le Pape, Karen van de Wolfshaar, Rochelle Seitz, Pierre Thiriet, Josianne Støttrup, Elliot Brown and Kenny Rose.

Annex 2: Recommendations

The working group has no formal recommendations.

Annex 3: WGVHES draft resolution 2019–2021

A Working Group on the Value of coastal Habitats for Exploited Species (WGVHES), chaired by O. Le Pape, France, and D. Eggleston, USA, will work on ToRs and generate deliverables as listed in the Table below.

	MEETING DATES	VENUE	REPORTING DETAILS	COMMENTS (CHANGE IN CHAIR, ETC.)
Year 2019	June	TBD	Interim report by August 2019	O. Le Pape and D. Eggleston
Year 2020	June	TBD	Interim report by August 2020	O. Le Pape and D. Eggleston
Year 2021	June	TBD	Final report by August 2021	O. Le Pape and D. Eggleston

ToR descriptors

ToR	DESCRIPTION	BACKGROUND	LINKS TO THE SEVEN ICES SCIENCE PRIORITY AREAS AS PROPOSED BY SCICOM	DURATION	EXPECTED DELIVERABLES
a	Review the application of the nursery habitat concept in management of exploited species and assess the need for refinement of the definition	There is a need for a quantifiable definition in science and a pragmatic definition in management	2 and 6	year 1–2	Review paper
b	Review and report on evidence that hard bottom and biogenic habitats support commercially important species	Lack of information on the value of structured habitats; continuation of ongoing work by expanding to additional habitat types and new aspects	3, 4 and 6	1, 2, 3	Review papers
c	Collate and document lessons learned on conservation of habitat for exploited species using experiences from different countries	Many countries are defining essential fish habitat and using experiences from various countries will increase efficiency and consistency of its application in management	2, 3, 6	1, 2, 3	Perspectives paper
d	Analyse the	There is an interest to	4, 6	1, 2	Scientific paper

contribution of juvenile abundance indices in forecasting stock recruitment to better utilize available information	integrate juvenile abundance indices in short-term forecasts to improve advice in stock assessment
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Summary of the Work Plan

Year 1	Continue the work on ToR a and begin the writing process. Finalise the review of hard-bottom habitats and continue ToR b with the inclusion of biogenic habitats and other aspects. Initiate the work on ToR c and continue the work on ToR d, following comprehensive scoping during the previous year.
Year 2	Complete the work on ToR a and continue the work on ToR b, c and d
Year 3	Finalise the ongoing work in ToR b, c and d and identify future research priorities or management needs

Supporting information

Priority	The current activities of this Group will lead ICES into issues related to the importance of coastal habitat for fisheries management.
Resource requirements	The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.
Participants	The Group is normally attended by 10–15 members and guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	There are no obvious direct linkages.
Linkages to other committees or groups	There are no obvious direct linkages.
Linkages to other organizations	There are no obvious direct linkages.

Annex 4: WGVHES self-evaluation

- 1) Working Group: Working Group on the Value of Coastal Habitats for Exploited Species (WGVHES).
- 2) Year of appointment: 2016
- 3) Current Chairs: Karen van de Wolfshaar (The Netherlands), Josianne G. Støttrup (Denmark), and Rochelle D. Seitz (USA).
- 4) Meetings:
 - 2016 Amsterdam, The Netherlands, 27 June–1 July, 12 participants;
 - 2017 Valletta, Malta, 26–30 June, 11 participants;
 - 2018 Copenhagen, Denmark, 25–29 June, 14 participants.

WG self-evaluation

- 5) If applicable, please indicate the research priorities (and sub priorities) of the Science Plan to which the WG make a significant contribution.

Our working group efforts have contributed to Science Plan objectives 2 (understanding ecosystems), 3 (impacts of human activities), 4 (observation and exploration), and 6 (conservation and management).
- 6) In bullet form, list the main outcomes and achievements of the WG since their last evaluation. Outcomes including publications, advisory products, modeling outputs, methodological developments, etc. *
 - Information from the working group review papers have been integrated into undergraduate and graduate marine science courses taught by D. Eggleston at NC State University US and by O. Le Pape at Agrocampus Ouest France. Recent review paper by Brown *et al.* 2018 is expected to be used in education at institutions outside this working group
 - Brown, E.J., Vasconcelos, R.P., Wennhage, H., Bergström, U., Støttrup, J.G., Wolfshaar van de, K., Millisenda, G., Colloca, F., Le Pape, O. 2018. Conflicts in the coastal zone: Human impacts on commercially important fish species utilizing coastal habitat. ICES Journal of Marine Science. <https://doi.org/10.1093/icesjms/fsx237>
 - R. N. Lipcius, D. B. Eggleston, F. J. Fodrie, J. van der Meer, K. A. Rose, R. P. Vasconcelos, and K. E. van de Wolfshaar. Modelling quantitative value of coastal habitats for exploited populations. To be submitted to *Frontiers in Marine Science*. The final draft is being commented on by the co-authors.
 - Hugo Flávio, Rochelle D. Seitz, Dave B. Eggleston, Jon C. Svendsen, Josianne G. Støttrup. Evidence that hard-bottom habitats support commercially important fish species: a systematic review for the North Atlantic Ocean and Baltic Sea. Draft being edited for submission to ICES JMS 2018
- 7) Has the WG contributed to Advisory needs? If so, please list when, to whom, and what was the essence of the advice.

- **Støttrup, J.** 2017. Essential Fish Habitats. EU parliament event on Restoring fish abundance by protecting Essential Fish Habitats. Brussels, June 1st, 2017. The aim of the event was to discuss progress on the protection of essential fish habitats under Article 8 of the EU Common Fisheries Policy and its contribution to rebuilding European fish stocks by 2020.
 - Since 2016, both the ministry in charge of environment and fisheries in France ordered a general studies of the available knowledge on essential fish habitats in French waters. **O. Le Pape** was in charge of this 2-year project for France. The project benefitted from WG group outputs, published papers and workshop discussions.
 - **J. Støttrup** and **E. Brown** provided data and trend analyses on changes in coastal fish abundance throughout the inner Danish waters. These were used to create indicators in support of a Baltic Sea wide assessment of coastal fish and, ultimately, to inform the HELCOM HOLAS II report on the “State of the Baltic Sea”.
 - Since 2016, **J. Støttrup** was awarded a project funded by the European Maritime and Fisheries Fund (EMFF) to map habitats for 10 exploited fish species in the inner Danish waters. The project is benefitting from interaction with the working group in developing the habitat maps. The results will be used in national advice both for the fisheries and environmental agencies.
 - **R. Lipcius** has been advising the National Oceanic and Atmospheric Administration’s (NOAA) Chesapeake Bay Office on oyster reef habitat suitability.
- 8) Please list any specific outreach activities of the WG outside the ICES network (unless listed in question 6). For example, EC projects directly emanating from the WG discussions, representation of the WG in meetings of outside organizations, contributions to other agencies’ activities.

There has been cross-fertilization between the working group and research projects of the working group members. For example, ideas and analysis were shared between the working group and an NSF mathematical biology grant on oyster reef habitat modelling led by R. Lipcius. In addition, an example of mapping marine fish habitats in a data poor situation was provided by Denmark. This was used to advise the Danish Nature Agency under the Danish Ministry of Environment and the Danish AgriFish Agency under the Ministry of Food, Agriculture and Fisheries in a situation where there were conflicts between different human activities and interests.

- 9) Please indicate what difficulties, if any, have been encountered in achieving the workplan.
- It is challenging to find sufficient time between meetings to work on projects from the working group.

Future plans

- 10) Does the group think that a continuation of the WG beyond its current term is required? (If yes, please list the reasons)

Yes, group activities to date have identified new topics and emerging issues related to the quantification of habitat value for fisheries management. A new term is necessary to extend and expand into these areas. The value of coastal habitats for exploited species is highly relevant to the new ICES science plan given the focus on integrated ecosystem assessments and advice for ecosystem based management.

- 11) If you are not requesting an extension, does the group consider that a new WG is required to further develop the science previously addressed by the existing WG.

N/A

- 12) What additional expertise would improve the ability of the new (or in case of renewal, existing) WG to fulfil its ToR?

Any additional expertise needed will be evaluated during the new period and ad hoc members added as appropriate.

- 13) Which conclusions/or knowledge acquired of the WG do you think should be used in the Advisory process, if not already used? (please be specific)

The group anticipates that outputs will be relevant for the Advisory process in future.