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Contribution to the Special Issue: 'Commemorating 100 years since Hjort's 1914 treatise on fluctuations in the great fisheries of northern Europe'

Where we are going

Food for Thought

Where has all the recruitment research gone, long time passing?

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For most of the past 100 years, research into recruitment processes—as pioneered by Johan Hjort—has been a consistent focus of research in fisheries science. This was reflected not only in the literature but in the organizational structures and research strategies of national and international fisheries research and management institutions. Over the past decade or so, we perceived that recruitment research is fading, if not into obscurity then at least into a more marginal place in fisheries and marine research. In this paper, we assess if our perception is real by quantifying trends in scientific publications and in the work activities within ICES during specific periods extending back to the 1920s. Our analysis documents a decline in research on recruitment processes. We put forward three possible hypotheses to explain this decline: 1. *All the key research questions about recruitment have been answered*; 2. *The volume of research on recruitment processes has declined because the answers are no longer relevant*; 3. *Recruitment research has been co-opted by more trendy, possibly ephemeral, and research topics*. There is little evidence to support the first two of these hypotheses and we consider the third to be the most plausible. Finally, we conclude that this new terminology/repackaging of recruitment research does not bring with it new and fresh thinking and, therefore, comes at a cost that should be carefully considered.

Keywords: climate change, ecosystem-based management, fish population dynamics, integrated assessments, Johan Hjort, recruitment variability, research prioritization in marine science.

Introduction

Johan Hjort studied the processes driving recruitment and population dynamics of fish, and his benchmark publication (Hjort, 1914) has provided a foundation and impetus for 100 years of research. The penetration and influence of Hjort's (1914) treatise has been remarkable (Aksnes and Browman, 2014). One century after its publication, it continues to be cited frequently, with citations having appeared in over 150 journals covering fisheries (22 journals), marine science (71), general ecology (23), general science (35), statistics and modelling (5), and even fields as distant as biomedicine.

For most of the past 100 years, recruitment processes has been a consistent focus of research in fisheries science. This was reflected not only in the literature but in the organizational structures and research strategies of national and international fisheries research and management institutions. Over the past decade or so, we perceived that recruitment research is fading, if not into obscurity then at least into a more marginal place in fisheries and marine research. "Recruitment" has become a modifier, or dependent clause, describing research that has some other focus, commonly something current such as climate change, the "ecosystem approach" or "integrated assessments". We interpret this observation to reflect a basic change in what is driving marine research—in the past, the driver was mainly bottom-up: the curiosity, ideas, and hypotheses of scientists determined what research was conducted. In the present, the driver is mainly top-down: large international government organizations and non-governmental advocacy groups drive research questions by allocating research funding in a short-term socio-economic and political framework and this determines what research is conducted. We will take up this change in what is driving the foci of our research activities elsewhere.

Adoption of the ecosystem-based approach to fisheries management (EBFM) was intended—at least conceptually—to significantly

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broaden the information, biophysical processes, and ecological concepts taken into account in the management of living resources. Hence, EBFM is at least a possible cause of a shift in the focus of fisheries research. According to FAO (1995, 2003), one of the basic pillars of EBFM is to take environmental drivers of stock dynamics into account. However, this emphasis on environmental drivers might have either increased the importance of recruitment research as a key pathway through which the drivers are experienced, or decreased its importance through empowering many other ecosystem factors to share the research spotlight with recruitment research. It is noteworthy that EBFM was adopted by national and international marine resource management institutions by mandate from the very top levels of international policy making (Browman and Stergiou, 2004, 2005). EBFM was adopted before most "bench-level" researchers actually knew what it was. What it actually is has yet to be completely worked out (it would not surprise us if we move on to something else before that actually happens—see Link and Browman, 2014). We view this is a seminal example of top-down-driven marine science. Climate change and high-profile offshoots such as ocean acidification are also deflecting the focus away from recruitment research, although again recruitment processes may be one of the common ways that climate effects are manifested in population and ecosystem dynamics.

In this essay, we first ask if the repackaging of recruitment research that we describe above is real. We assess this by quantifying trends in scientific publications and in the work activities within ICES during specific periods extending back to the 1920s. We then asked what the drivers of this trend are, and what the influence of those drivers on fisheries research might be. We also discuss whether this trend should be considered a good thing in that it represents a divesting of a century-old framework of hypotheses for understanding recruitment variability that has proved increasingly cumbersome and unhelpful or, alternately, that it is not such a good thing because it has resulted in a loss of focus on questions that are at the very heart of fisheries research (see Hare, 2014).

Methods

Orientation. Our objective is to get readers to think about what, if anything, has happened in recent years to the traditional focus of fisheries research on recruitment processes. Our analysis could not be exhaustive. However, by focusing selectively on key fisheries terms and phrases from several relevant sources, we were able to assess whether or not any trend exists. We selected the year 2000 as the beginning of the postulated shift in focus away from recruitment research. That choice is based upon the dates of the Reykjavik Declaration (2001) and the 2002 World Summit of Sustainable Development, important policy benchmarks that installed EBFM as the international framework for the management of living marine resources (Rice, 2014). All decisions about the analytical approach (e.g. periods selected, search terms, etc) were made *pre factum* and were not modified *post factum*.

Indicator 1: historical trends in citations of Hjort (1914) and in recruitment research

We used two approaches to assess whether there have been historical changes in the intensity of recruitment-related research. First, the number of citations to Hjort (1914) were obtained from Thomson Reuters's Web of Science (WoS) using the database citing reference function. These were tabulated by year, but only back to 1950 because of uncertainties about the extent of journal coverage before then. To normalize for the overall increase in the number of publications in marine science, the WoS was used to obtain the number of publications per year that were retrieved using "marine" or "fisheries" as keywords in the topic search field. Although the search extended back to 1950, only results from 1970 onwards were used because of incomplete journal coverage in the WoS before that year. For the period 1970–2012, an overall linear regression was fit to publications-per-year citing Hjort (1914), and to the annual ratio of publications citing Hjort (1914) to the total number of publications retrieved by the keywords "marine" or "fisheries" (we consider the latter indicative of the trend in publications that might consider Hjort (1914) relevant). A second pair of regressions were fit to the periods 1970–1999 and 2000–2012 to see if there has been a recent change in those trends. The degree to which the piecewise regression improved fit to the data gives some indication of how different the recent trends are from earlier ones (taking the larger number of parameters to be fit with piecewise regression into account using Akaike information criterion; Burnham and Anderson, 2002).

Second, archived issues of the *Transactions of American Fisheries Society*, the *ICES Journal of Marine Science*, and the *Canadian Journal of Fisheries and Aquatic Science* were accessed and all articles from three decades of interest were examined: 1925–1934, 1979–1988, and 2002–2011. The decades of interest were chosen as being relatively soon after the publication of Hjort (1914), but long enough after for there to have been penetration of the ideas presented into fisheries research, the decade immediately following extension of jurisdiction with UNCLOS when there was great interest in fisheries and marine research generally, and finally the decade after the adoption of EBFM. Only the materials classified as research articles by these journals were included in the analysis. For articles accompanied by abstracts, the abstracts were sorted based on a keyword search (recruit*) then scored depending on whether the study was primarily concerned with recruitment variability (high score), addressed the topic of recruitment in some capacity (low score), or did not relate to recruitment (no score.) For articles without an abstract, the same analysis was completed by scanning the body of the article. Titles of articles in the two more recent decades that were not returned in the keyword search were scanned and scored for relevance as described above. All articles in the earliest decade were scanned in this manner, if the term "recruitment" and its derivatives had not penetrated the literature. Once all articles were scored, results were expressed as a percentage of total research articles published per journal, per decade, with high-scoring articles given full weight (1.0) and low-scoring articles given less weight (0.5). A total of 10 898 articles were examined.

Indicator 2: prominence of recruitment research in ICES activities throughout its history

Three periods were selected for assessment: 1925–1934, when we considered that research collaboration in ICES (and investments by members) had fully recovered from the effects of the first world war but were not yet being affected by the lead-in to the second world war; 1985–1989, when we considered research programmes would have adjusted to the added responsibilities of extended national exclusive economic zones but not yet been dominated by the coming crises in groundfish stocks; and 2008–2012, the most recent period. The first period was longer than the other two in order that the total number of activities considered during each period was comparable. Sources of information for this analysis were the nature of the work reported to ICES in either the annual Procès-Verbaux (1925–1934) or Expert Group CR documents

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(1985–1989), or the tasks assigned to ICES Expert Groups in their Terms of Reference (2008–2012). Methods of information extraction and statistical comparisons are described in detail in the Supplemental Material.

Indicator 3: the importance and precision of recent recruitment estimates

We extracted the proportion of the fishable numbers composed of new recruits, and the uncertainty of those estimates, for the final assessment year (usually 2012) of the most recent benchmark-scale assessments of 24 stocks, six each from the ICES Northeast Arctic and North Sea regions and from the US New England/Gulf of Maine and Bering Sea/Gulf of Alaska areas (listed in Supplemental Material). Each was a major stock for the region. A scatterplot of the percentage of numbers-at-age in the fishable stock that are new recruits against the coefficient of variation (CV) of the estimate was generated to illustrate the degree to which recruiting cohorts contribute to fisheries and how accurately assessments estimate the sizes of these recruiting cohorts for these 24 "flagship" stocks. No statistical analyses of the ratios and CVs were undertaken because of the *ad hoc* manner in which several of the stock-specific CVs were estimated. Moreover, because of interannual variation in recruiting year classes, had a different year been chosen from the numbers-at-age vector, the ratios on the *x*-axis would have been different as well. Therefore, this material is not presented as a quantitative result but is rather used illustratively in Discussion.

Results

Historical trends in citation of Hjort (1914) and in recruitment research

The absolute number of citations to Hjort (1914) increased significantly from 1978 to 2012 (Table 1 and Figure 1). However, scaling citations to Hjort (1914) against the total number of publications in marine science in each year reveals different trends with time: between 1978 and 1990, the proportion of publications that cited Hjort (1914) increased significantly, while from 1991 to 2012 it decreased (Table 1 and Figure 2). This proportional annual decline by ~2 expected citations per year at recent total publication rates has been stable for the past 20 years. We note that there was a doubling of "marine" publications from 1990 to 1991—although this is difficult to explain, it seems likely that it is due to a change in journal coverage by the WoS.

The percentage of articles that were related to the topic of recruitment variability published in *Transactions of American Fisheries Society* and the *ICES Journal of Marine Science* as a proportion of all the articles published in those journals decreased from the earliest through the most recent decade of interest, although it has remained stable in the *Canadian Journal of Fisheries and Aquatic Science* (Figure 3).

Table 1. Statistical results of regressions of absolute numbers or proportions of publications in scientific journals that cite Hjort (1914), over various time intervals.

Attribute	No. of citations[a]	Proportion citing Hjort[b]	
Time interval	1978–2012	1978–1990	1991–2012
Slope	1.155	0.00133	−0.000146
Intercept	3.897	0.00133	0.00626
d.f.	34	11	21
Probability	<0.001	$0.01 < p < 0.05$	<0.01
% variance explained	0.829	0.271	0.614

[a]Number citations per year citing Hjort (1914).
[b]Proportion of all marine or fisheries papers citing Hjort (1914).

The role that recruitment research has played in ICES work

The results of the inventories of total activities reported in ICES outlets appropriate to the three selected periods, and the number of those activities that might be considered to contribute to research on recruitment, are presented in Tables S1–S3 of the Supplemental Material. Because of the different sources of records of activities during the three periods, no overall comparisons were undertaken. However, individual proportions can be compared both within and across the three periods.

Overall, a significantly lower proportion of ICES work was related to recruitment research in the late 1980s (Supplementary Table S2) than in the 1920s and 1930s (Supplementary Table S1), and the proportion of all work (ToRs) considered possibly related to recruitment research was significantly lower in 2008–2012

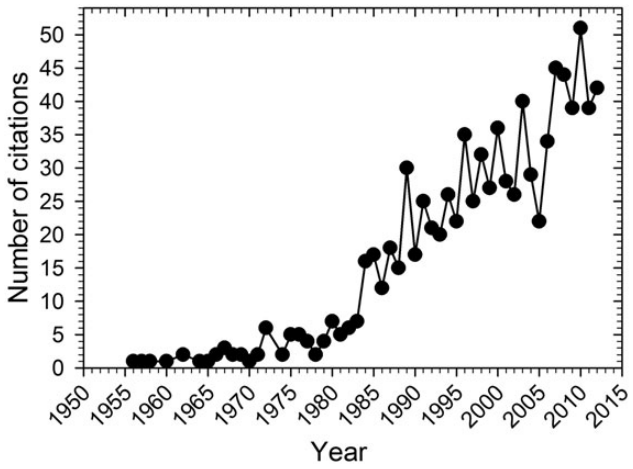

Figure 1. Absolute number of citations to Hjort (1914) per year (1956–2012) from the Thomson Reuters Web of Science database.

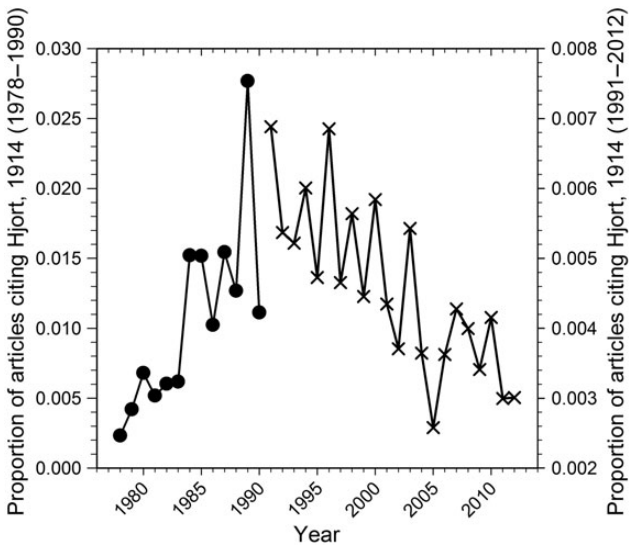

Figure 2. Citations to Hjort (1914) as a proportion of all publications in marine and fisheries science from the Thomson Reuters Web of Science database. Data are for 1978-1990 (solid circles,scale on left) and 1991–2012 (crosses and scale on right).

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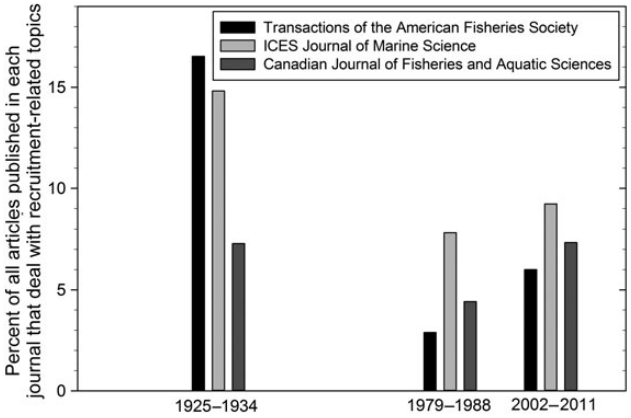

Figure 3. The percentage of all articles published in three fisheries science journals during three decades (1925–1934, 1979–1988, and 2002–2011) that deal with "recruitment"-related research topics.

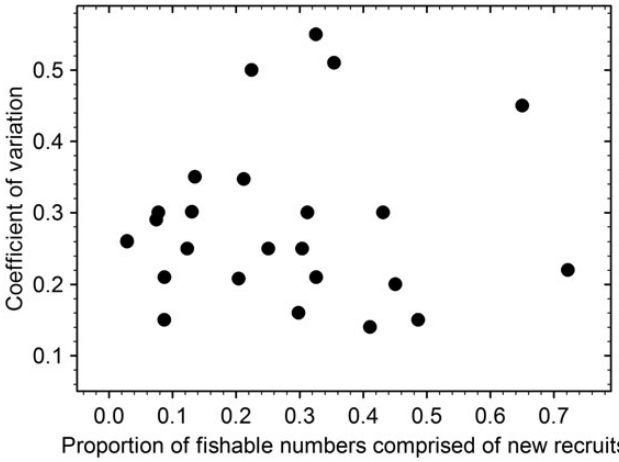

Figure 4. Precision of estimates of the newly recruited year class (represented by the CV of the estimate) as a function of the proportion that year class comprises of the fishable stock numbers for the 2012 assessments of 24 stocks for which full age-structured assessments are available from ICES or the United States National Marine Fisheries Service. The stocks plotted are listed in the Supplemental Material.

(Supplementary Table S3) than in the late 1980s (Supplementary Table S2). The comparisons presented in the Supplemental Material show that some of the decline in the importance of activities relevant to recruitment research in ICES has been due to an increase in the dominance of activities directly feeding assessments and other advisory demands. Since the 1990s, however, even among non-advisory work, the importance of recruitment-related activities has dropped significantly, after representing nearly a quarter of ICES work for over 60 years.

The importance and precision of recent recruitment estimates

A review of the age composition of the 2012 populations of 24 flagship fish stocks from two major stock assessment authorities (ICES and the United States National Marine Fisheries Service) shows that new recruits comprised at least 20% of the fishable population in two-thirds of the stocks (Figure 4). Five stocks had $<10\%$ of the fishable population comprising new recruits (Figure 4). However, this reflected interannual variation in year-class strength, not fisheries targeting the older fish in the population. In the three stocks with the lowest percentages of new recruits in the fishable biomass in 2012 (North Sea Herring, Georges Bank Herring, and Northeast Arctic Coastal cod), it is noteworthy that, had the calculations been made for the 2011 population, new recruits would have constituted ~53, 35, and 11%, respectively, of fishable numbers (see Supplemental Materials). Not only is year-to-year variation in recruitment large but annual estimates of recruitment are associated with CVs of 30% or more; larger than the CVs of older ages in the assessment (Figure 4).

Discussion

Our first two indicators, based on historical patterns in publications and ICES work related to recruitment processes, indicate that research on recruitment, while not fading into obscurity, is declining in relative importance and in visibility. Indicator 1, the likelihood that the seminal article by Hjort (1914) will be cited, has declined significantly since 1990, after increasing in the decades before that. In addition, the relative proportion of articles about recruitment appearing in two of the main fisheries journals has declined. Indicator 2, ICES work possibly relevant to recruitment research comprised approximately one-quarter of all ICES non-assessment work from the 1920s to the end of the 1980s, but by the most recent 5-year period had declined to barely 10%. This decline is amplified when all the ICES work related to advisory activities is considered, reducing recruitment-related ToRs to barely 5% of all work, even when applying a very generous standard for relevance to recruitment. Although we have not quantified it here, a quick look at the organizational structures and scientific work plans of the world's major marine science/fisheries institutes reveals that the term "recruitment", and terms associated with it, have essentially disappeared. This is exemplified by Johan Hjort's own home institute in Norway—the Institute of Marine Research—and by the research centre that bears his name, the "Hjort Centre for Marine Ecosystem Dynamics". Interestingly, when the Hjort Centre was first proposed in 2005 its name was "Johan Hjort Centre for Fish Recruitment Research" (HIB was a member of the writing team for that application).

In the interest of motivating readers to think about what all of this means, we consider three possible hypotheses to explain this historical trend then go on to present some of the benefits, and costs, of this new reality in fishery science.

Hypothesis 1. All the key research questions about recruitment have been answered.

There is little evidence to support this hypothesis. The 2000s marked the opening of a new millennium, and were accompanied by a number of books and papers intended to lay out the future direction of fisheries and marine science, all trying to sound as forward-looking and innovative as possible (Table 2). Tellingly, none of the quotations, nor the documents from which they were drawn, concludes that the "recruitment question" originally posed by Hjort (1914) has been answered. Rather, in some form or another, each imbeds the still-unanswered questions about the drivers of recruitment variability into even larger and more complex questions. For example, the ICES Strategic Plan (2002) aims to "describe, understand, and quantify the state and variability of the marine environment in terms of its physical, chemical, and biological processes", to "Understand and quantify the role of climate variability and its implications for marine ecosystems" and to "Increase knowledge

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Table 2. Extracts from either strategic documents of marine science organizations or government departments, or from "Centennial books" prepared to lay out the future for marine science in the 21st century.

Authors and source	Quotation
R.J. Beamish and B.J. Rothschild. The Future of Fisheries Science in North American. Springer 2009	"The common thread that related all the problems is the basic *understanding of single-species population dynamics* in a multi-species setting involving physical forcing". (p. 9)
ICES Strategic Plan 2002	Describe, understand, and quantify the state and variability of the marine environment in terms of its physical, chemical, and biological processes; (i) Understand and quantify the role of climate variability and its implications for marine ecosystems. (ii) *Increase knowledge of the life history*, stock structure, *dynamics*, and trophic relationships of living marine resources.
40 Priority Research Questions For Ocean Science In Canada A Priority-Setting Exercise by the Core Group on Ocean Science in Canada—Council of Canadian Academies	Although the entire report avoids the term "recruitment", understanding recruitment variation underlies priority research questions: 11, 12, 13, 15, 16, and 17, and is relevant to questions 1, 3, 7, 28, and 29.
EU Marine Board: Science dimensions of an Ecosystem Approach to Management of Biotic Ocean Resources (SEAMBOR) Marine Board-ESF Position Paper 14	Priority gaps for an ecosystem approach are: (i) Understanding the dynamics and resilience of populations, communities and ecosystems. (ii) Scales of variation in ecosystem state and function—over what time and space scales do ecosystems vary and by how much? What are the critical natural factors and processes which determine ecosystem function and state? (iii) Processes of ecosystem change—when ecological change is large and difficult to reverse. (iv) Interconnected ecosystems and their dynamics, the importance of complexity and diversity in maintaining healthy seas.

Extracts are direct quotations of whatever strategic goal(s) or research theme(s) was considered to include work that would have been recognized in earlier decades as "recruitment research".

of the life history, stock structure, dynamics, and trophic relationships of living marine resources" without ever mentioning recruitment in the key activities (see Table 2). Several avoid the word "recruitment" altogether, while proceeding to describe parts or all of exactly the work that Hjort (1914) brought into focus regarding how environmental drivers, biotic interactions, and exploitation affected the dynamics of the large fish stocks of the North Atlantic. This indicates that recruitment questions may be falling out of favour, at least if posed as questions about recruitment variability *per se*. However, we perceive that the processes and relationships of interest to Hjort remain key research questions today, they are simply packaged using different jargon.

Hypothesis 2. The volume of research on recruitment processes has declined because the answers are no longer relevant.

There is little evidence to support this hypothesis. Neither the relevance of recruitment to strategic research planning discussed above nor our review of two dozen flagship stocks from northwest Europe and the United States, supports this hypothesis. With the great emphasis on fisheries advice documented with Indicator 2 (Supplementary Tables S2 and S3), new recruits commonly comprise a substantial part (at least 20%) of the fishable stock (Figure 4) and their numbers are known less accurately than the numbers of older age classes (Figure 4). This leads us to conclude that the abundance of recruits still matters to the harvest of many important fish stocks and is, in fact, one of the more uncertain estimates in the annual assessments of stock status. Analytical methods used in developing harvest advice can manage the risk associated with this greater uncertainty in incoming recruitment, but at a high cost in forgone harvest (Engan *et al.*, 1997; Winemiller, 2005). However, these results are inconsistent with the hypothesis that recruitment research is decreasing because recruitment estimates no longer matter in assessment or management.

Hypothesis 3. Recruitment research has been co-opted by more trendy, possibly ephemeral, research topics.

We consider this a plausible hypothesis, for the following reasons. The word "recruitment" is notably absent from the strategic goals and research priorities being proposed by leading thinkers, agencies, and institutes involved in fisheries science (Table 2). Nevertheless, almost every description of research on how climate change may impact marine ecosystems (e.g. Blanchard *et al.*, 2012; Hollowed *et al.*, 2013), or what factors should be considered under EBFM (Francis *et al.*, 2007; Rice, 2011) or integrated assessments (see Link and Browman, 2014 and articles cited therein) focuses on the parameters of population productivity—recruitment, growth, and natural mortality. Moreover, of these three parameters, interannual variability in recruitment continues to be greater, often *much* greater, than interannual variability in the other two factors. From this we conclude that the "recruitment problem"' has not gone away. Rather, it appears to have been stealthily subsumed by new terminologies, although possibly not with a very different agenda.

In our view, the core question that stems from the preceding is whether this new terminology/repackaging brings with it new and fresh thinking. If so, then the repackaging may be providing substantial benefits. If not, there may be costs. We take this question up in the remainder of this paper.

Possible benefits of repackaging the "recruitment problem"

Some potential benefits of repackaging recruitment research as a subset of EBFM or climate change impacts are as follows:

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(i) Conferring more immediacy and a broader applied context. This might bring the results of recruitment research into practice in policy and management faster, rather than leaving the results as just greater academic knowledge that has to then be brought into policy and management by some other avenue. Rendering the research more immediate also plays into the race for "impact", such as more citations to articles within the first 2 years following publication (and, therefore, a higher journal impact factor) and media coverage.

(ii) Embedding recruitment research into a broader applied question might allow the research community to ask at what point is enough understood about recruitment variation so that research into other areas of uncertainty could be prioritized. This is because the processes determining recruitment are complex and, therefore, research into these processes has sometimes got lost in the details of that complexity with a resultant loss of focus on the bigger picture.

(iii) Encouraging broader and more imaginative thinking. New ways of looking at old problems can sometimes shed new light on factors that had been impeding progress.

All these are attractive benefits, *if* they are actually happening—readers can decide for themselves if they are.

Possible costs of repackaging the "recruitment problem"

The potential costs of repackaging recruitment research include the following:

(i) Tying recruitment research to one specific use of the knowledge and one specific aspect of "understanding". While this might allow fisheries management to improve in a particular way, the applied path may not provide any general insight into what causes variation in recruitment. Nesting explanations of recruitment variation in the specific context of fisheries management may make it harder to apply the knowledge of recruitment processes to other policy and management contexts, such as conservation of inherently rare species or habitat restoration.

(ii) Placing recruitment research in competition with other "ecosystem aspects" of the same stock and fishery, or other aspects of research on climate–ocean interactions, may encourage research teams to work on simpler processes for which answers may be easier and quicker to obtain, leaving questions about recruitment variability unexplored despite their greater importance to stock or ecosystem dynamics.

(iii) Removing the incentive and context for looking at broad process-based answers in favour of mechanical descriptions of the pattern in environmental drivers of stock dynamics, whether in the context of climate or fisheries pressures. Researchers may be satisfied with superficial relationships that have some short-term (and possibly ephemeral) predictive power, and not give the relationships the scrutiny that they would receive in a process-oriented study of recruitment.

(iv) Distancing "modern" research from "old" concepts of recruitment will, over time, isolate us from the rich history of recruitment research. Because good researchers have worked on "the recruitment problem" for decades, and found the problem complex but tractable (at least in pieces), many important lessons have been learned. There is no certainty that those lessons will be transferred to research on EBFM or climate–ocean interactions, particularly if the specific term "recruitment" is being avoided.

(v) Some have argued that "the recruitment question" is simply too difficult because too many physical, chemical, and biological factors affect recruitment and the weights of the specific drivers in determining year-class strength may be quite different from year to year (e.g. Suda *et al.*, 2005; Zhang *et al.*, 2010). While this complexity is real, subsuming recruitment research within EBFM or climate–oceans research does not make the natural science aspects of the recruitment problem suddenly easier. Rather, the already complex recruitment problem becomes a part of even larger and more complex problems. It seems difficult to argue that making a hard problem even harder makes it easier to solve.

(vi) EBFM and climate change adaptation research have strong socio-economic components (Miller *et al.*, 2010; Charles, 2012). Embedding recruitment research into these broader questions adds new dimensions of complexity to the research environment, as well as making the natural science dimension even more complex.

(vii) Following from the last three points, historically, recruitment research was embedded in a strong scientific culture, with many researchers more interested in increasing knowledge than in being directly involved in fisheries policy. This may have accorded recruitment research some protection from partisan politicization. Both EBFM and climate change research occur in politicized contexts with much shorter histories—therefore, they may not have as effective a culture of independent science, even if the scientific community strives for it. Bringing recruitment research into these highly politicized decision-making contexts adds new political challenges while removing few if any of the previous ones.

The list of potential benefits of making recruitment research a subsidiary of some greater research questions is short and, in our view, does not overcome many and basic drawbacks.

A large fraction of the questions central to EBFM and climate change research are about how various drivers affect, and are affected by, recruitment variation. Calling research on such questions "recruitment research" would not make the results any less available for uptake by managers and policy makers, but would place the results in a larger historical context than if they were presented as a minor part of some larger EBFM or climate-related research programme.

If the trends that we identify here continue, we will be allowing a key unanswered question in aquatic population and community dynamics to fade away before it was answered or demonstrated to be unworthy of further attention. Recruitment variation still matters, for all the reasons that prompted John Hjort to undertake the work that made him a great leader of marine science, during his time and thereafter (Rozwadowski, 2002; Aksnes and Browman, 2014; Hubbard, 2014; Schwach, 2014). Research into the drivers of recruitment variability is directly relevant to ecosystem-based fisheries policy and management, and to developing adaptation strategies in the face of climate change. Reducing and/or disguising research on recruitment is not a great precedent to be setting at any time, and particularly not on the centenary of Hjort's seminal treatise. We should not be turning our back on his legacy—studying recruitment variability is as relevant today as it was 100 years ago.

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Supplementary data

Supplementary material is available at the *ICESJMS* online version of the manuscript.

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