




Peer Community In Ecology

A cost-effective and non-invasive approach to estimating population dynamics in waterfowl

Huihuang Chen  based on peer reviews by 2 anonymous reviewers

Adrien Tableau, Iain Henderson, Sébastien Reeber, Matthieu Guillemain, Jean-François Maillard, Alain Caizergues (2024) Delayed dichromatism in waterfowl as a convenient tool for assessing vital rates. bioRxiv, ver. 3, peer-reviewed and recommended by Peer Community in Ecology. <https://doi.org/10.1101/2024.06.04.597326>

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This article highlights a novel non-invasive method based on the "apparent sex ratios" that exploits delayed sexual importance in waterfowl populations. Unlike traditional capture-mark-recapture (CMR) technique, which is costly, invasive, and may disturb the target species, this method infers key population dynamics, such as adult survival rate and recruitment rate, by monitoring sex ratios in counts conducted during winter. Juvenile males that resemble adult females before molting provide a unique opportunity to estimate these vital rates. This method is cost-effective, minimizes disturbance to the species, and is particularly suitable for studying protected or invasive species.

References:

Adrien Tableau, Iain Henderson, Sébastien Reeber, Matthieu Guillemain, Jean-François Maillard, Alain Caizergues (2024) Delayed dichromatism in waterfowl as a convenient tool for assessing vital rates. bioRxiv, ver.3 peer-reviewed and recommended by PCI Ecology <https://doi.org/10.1101/2024.06.04.597326>

Reviews

Evaluation round #1

DOI or URL of the preprint: <https://doi.org/10.1101/2024.06.04.597326>

Version of the preprint: 1

Authors' reply, 03 January 2025

[Download author's reply](#)

Decision by [Huihuang Chen](#) , posted 14 September 2024, validated 16 September 2024

Please revise based on the opinions of two reviewers.

Reviewed by anonymous reviewer 1, 27 August 2024

The manuscript presents a very interesting approach to try to measure the effect of productivity and survival from count data conducted in the winter. To assess their new model the authors have tried to compare their model output to other external sources of data. The results of their model seems to align with these external sources of data so their "apparent sex ratio" method seems to hold promise.

The title of the manuscript clearly reflect the content of the article. The abstract present the main findings of the study but should be refined (see suggestions below).

While I find the approach very interesting, I think the authors should provide more information in their method section, so that the readers can better assess the validity of the proposed model. In particular I found difficult to figure out how many distinct models were used to complete this manuscript.

I was less convinced by the discussion about the effectiveness of the different culling strategies in relation to the population dynamic of the species. The culling strategies were used in two populations that were not on the same scale but also were probably very different in term of effectiveness (i.e., culling large groups vs culling breeding pairs and individuals).

I was more puzzled than satisfied with the part of the discussion that tries to relate population dynamics under a cull order to regular harvest seasons. Figure 8 seems to imply than more than 95% of the population of Ruddy duck was culled in GB. It is hard to relate the population dynamics of such a system to a regular harvest framework were managers will aim to harvest population at the maximum sustainable yield (or any other strategy).

I think some more general statement of the applicability of the proposed method for other species and other populations would be useful more.

I have outlined some more targeted minor and majors concerns below.

#Minor and major comments

In general for the abstract, I would suggest that instead of focusing on the limitations of capture, mark, recapture programs the authors should give us more information on the data they used for their analysis, the assumption of their model, and how their model hold against these assumptions.

L3 – Capitalize « Unfortunately »

Figure 1: Are those winter or spring survey? A mix of both?

L70: Some of the assumptions of the model are described below but it would probably be beneficial to regroup them in a section or a table. If you use a table, you could point out how you tested those assumptions with other datasets and if the assumptions are always respected.

Figure 3: Are those data from the Great Britain, France, both country?

Figure 4: I like this figure, but I am not sure which data set inform with parameter. Can you subset the first table to clearly link the observation to each one of your dataset that you used?

Figure 4: What is the difference between $C[i,t]$ and $N[i,t]$?

L79-80: Would it be possible to report more information on the magnitude of the cull in both country in the text rather than in an Annex?

L73-74: Those are the same count that were conducted in Great Britain from 2006 to 2012 and in France in 1999, 2001-2009, and 2012-2019? I am wondering if there are surveys without the apparent sex-ratio and some years were the sex-ratio was recorded.

L78-80: Once again I am not sure if you mean that winter count were not made in France in 2000 and 2010-2011 or that there were winter surveys but that the apparent sex was not recorded during those surveys.

L79: I would suggest a paragraph break before "In both countries, [...]". To help the reader understand that you are now addressing a new dataset.

L93-94: "A preliminary analysis indicated" that the proportion of males also did not differ statistically between years?

L94-95: Is the sex ration among juvenile and adults similar? Or do you mean to say that the sex ratio among adults did not differ significantly among years?

L110: (Nichols et al. 1997)

L141-142: So to be clear you used 10 years of data in GB and 5 years in FR to evaluate the population maximum growth rate and you fit the model for each country independently?

L150-151: It is not clear to me if you run both sub model in the same model or did you compare the posterior distribution of both model after running them independently.

L153 – 156: You refer to the proportion of adults in both country which makes me wonder if the adults were deliberately targeted? Is there a reason why juvenile were not included in the cull or in the proportion you presented?

L160-162: How many year of culling data from GB did you compare to FR?

L164: How many submodel did you run exactly? It could be good idea to name them so that we can track all of them.

L172: Did you also monitor your effective sample size? You don't need to report it, but you should make sure that the effective sample size is high enough for all the parameters of interest.

L173: Which CI did you use? You mentioned that posteriors are skewed so did you use High Density Intervals?

L174: It would be nice to present a recap of the all the dataset you used. The average population size in GB and in France. The numbers of ducks that were culled and used in each of the analysis, etc. Doing so gives us a more general idea of the sample size involved in your analysis.

L178? How does one come to the conclusion that the Adult survival, recruitment rates, and population growth rate are correctly estimated? Probably because they have produced realistic values that are aligned with external sources of data?

Figure 5: I have trouble reconciling the very high cull rate presented in Figure 8 and the survival rates presented in Figure 5 in France. Maybe it is simply something that I misunderstood. Did you try to assess the correlation between survival and the cull rate?

L180-182: I suggest that your emphasis in your results which parameter is directly estimated from the data and which parameters is latent in your analysis.

For example: The proportion of males among adults, which is a prerequisite for inferring the proportion of immatures, was estimated at 0.60 "in the GB population between XXXX and XXXX".

Another example: The proportion of immatures was "estimated" to range between 0.16 [0.07; 0.24] and 0.54 [0.44; 0.62], depending on the population and year "by the model".

190: Would it not be simpler to say "consistent" rather than "not inconsistent"?

L92-193: Could this be because you estimated only seven years of data for GB but 18 years of data from FR?

L201-202: True. But at the same time the apparent decline in the GB population is tied to the high survival rate observed in 2005-2006 so it is difficult to extrapolate to the entire time series.

L211-213: Minor caveat but this sounds more like a discussion item (which you address below) rather than a result.

L226: You may want to put "see 3rd Materials & Methods section" in parentheses.

L234-236: I am wondering if the differences observed in two the culling programs are really related to the timing of the cull, as implied in the results and discussion, or if the issue is related to the size of the cull. It seems to me you will be more efficient if you try to cull a population of a few thousand individuals than trying to cull a population of a few hundred individuals.

L257-263: In North America most counts take place during the breeding season as many winter count have been phased out. It would be nice if you could suggest other species/situation to which your model could be applied to in the future.

L269: Are there many populations that are monitored by winter survey that can be safely assumed to be "closed" in Europe? Or is this new method doomed to be used only on a few cases study?

L285- 287: Was that an hypothesis that you wanted to test? I guess I am not too sure why you expected those results.

L296-297: You mean the results of the preliminary analysis conducted on the GB data? Or the results of your "apparent sex ratio" model?

I have the impression that if sex-ratio was variable in your model (instead of being fixed) the confidence intervals in your models would have been slightly higher.

L307: Given that you were unable to assess this parameter maybe use "could" instead of "would"?

L365-366: I can live with "biased" estimates of adult survival or recruitment rates from the proposed model but what are the consequences of using the parameters in a management framework?

L371-373: I would need to have more information on the methodology of the winter surveys conducted in Europe (or elsewhere) to assess the validity of this recommendation. Are there a lot of surveys right now where the sex of the observed ducks are not recorded?

Reviewed by anonymous reviewer 2, 14 September 2024

I reviewed a pre-print entitled "Delayed dichromatism as a convenient tool to disentangle the effects of survival and productivity on the population dynamics in waterfowl". The work is intended to investigate how, in dimorphic species, delayed sexual maturity of males can be used to estimate adult survival and recruitment rates by distinguishing male-like and female-like individuals in winter counts. The authors used the "apparent sex ratio" method to estimate adult survival and recruitment rates and evaluate the effects of two different eradication strategies used in Great Britain and France, respectively. The study is interesting and could be a valuable contribution. There is a dire need to develop tracking methods to effectively measure changes in population size and population growth rate to assess the relevance of management actions.

Title and abstract

Does the title clearly reflect the content of the article? No

The abstract section needs significant improvement, mainly highlighting the limitations of previous methods, the authors need to present their key findings here.

Introduction

Are the research questions/hypotheses/predictions clearly presented? [] Yes, [P] No (please explain), [] I don't know

The introduction section lacks hypothesis and proper research questions. This sections sufficient evidence, and briefly explains the limitations of what has done earlier. At the end the authors have also provided scientific rationale of the current study. Authors are suggested to state a clear and concise hypothesis and specifically mention the research questions which are solved in the current research.

Does the introduction build on relevant research in the field? [P] Yes, No (please explain), I don't know

Materials and methods

Are the methods and analyses sufficiently detailed to allow replication by other researchers? [P] Yes, No (please explain), I don't know

Are the methods and statistical analyses appropriate and well described? [P] Yes, No (please explain), I don't know

Results

In the case of negative results, is there a statistical power analysis (or an adequate Bayesian analysis or equivalence testing)? [P] Yes, No (please explain), I don't know

Are the results described and interpreted correctly? [P] Yes, No (please explain), I don't know

Discussion

Have the authors appropriately emphasized the strengths and limitations of their study/theory/methods/argument? [P] Yes, No (please explain), I don't know

Are the conclusions adequately supported by the results (without overstating the implications of the findings)? [P] Yes, No (please explain), I don't know