Appendix I

ADDITIONAL METHODOLOGICAL DETAILS

Appendix 1a: Original online survey

Welcome! We hope you will contribute to your ideas about the future for Mediterranean wetlands through this survey. Your responses will help direct future research and policy for Mediterranean wetlands, making a real difference to their conservation and sustainable use

1. Overview of the survey

There are three main parts to the survey. For parts (1) and (2), you can respond to either or both parts in as much or as little detail as you like.

(1) identifying **future issues (positive and negative)** for Mediterranean wetlands

(2) identifying **important research questions** for the conservation of Mediterranean wetlands

(3) some quick and easy questions about you

2. Definitions

Mediterranean wetlands are any wetlands (according to the Ramsar Convention: areas of marsh, swamp, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt) within the green shaded area on the figure below (Mediterranean biome + related ecoregions + Mediterranean watersheds). Our definition of Mediterranean wetlands also includes areas of marine water < 6 m deep at low tide, along any coast of the green shaded area.
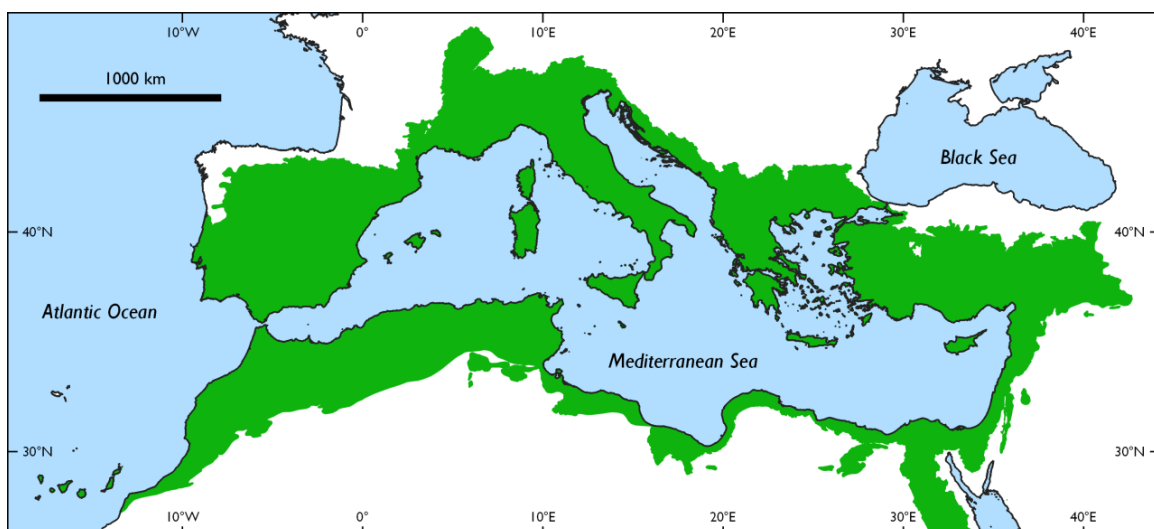
3. Who is conducting the survey and why?

This survey is being conducted by **Tour du Valat**, Research Institute for the Conservation of Mediterranean Wetlands, and **MedWet**, the Mediterranean Wetlands Initiative. The results will contribute to strategic planning for future research activities. We plan to write up the results as a scientific paper too. The results will also contribute to an ongoing **AFD-FFEM** project to strengthen Mediterranean NGOs involved in wetland conservation.

4. Data collection and use

We will collect some personal data in this survey. Your personal information will be treated as confidential. The name and country of your organization may be included in a list of participants unless you inform us otherwise. The issues and research questions submitted will be used for research purposes and they will be shared anonymously during a subsequent prioritization process. By completing this survey you consent to this use of information. You are free to withdraw at any time. [Contact e-mail address was provided here]

Q1. What are some key issues that might affect Mediterranean wetlands over the next 30 years (2020–2050)?

- These issues might be threats or opportunities; might have negative or positive effects (or both); might be well-known or poorly-known; might be a continuation of current issues or completely new issues; and might range from low-impact but likely or widespread, to high-impact but unlikely or small-scale.
- Issues might affect the overall extent, state, biodiversity, functioning or services of Mediterranean wetlands, or might affect a specific aspect of a specific wetland.
- You do not need to fill all 10 boxes, but please fill as many as you can.
- Some detail in your answers would help: please try to write a sentence or two, rather than just a single word in each box.
- The order of your responses does not matter.
- There are no wrong answers!

Issue 1	
Issue 2	
Issue 3	
Issue 4	
Issue 5	
Issue 6	
Issue 7	
Issue 8	
Issue 9	
Issue 10	

Use this space to add any comments or further explanation (optional)

Q2. What are some important research questions for the conservation of Mediterranean wetlands over the next 30 years (2020–2050)?

- "Important" questions are those which, if answered, would have the greatest impact on the conservation of Mediterranean wetlands.
- For example, questions might relate to the overall extent, state, biodiversity, functioning or services of Mediterranean wetlands, or might affect a specific aspect of a specific wetland.
- Questions should be answerable through a realistic research design (including literature reviews) – so should not be too broad or general.
- Questions should have a factual answer that does not depend on value judgements. If in doubt, submit your questions and they can be refined later.
- You do not need to fill all 10 boxes, but please fill as many as you can.
- The order of your responses does not matter.

Question 1	
Question 2	
Question 3	
Question 4	
Question 5	
Question 6	
Question 7	
Question 8	
Question 9	
Question 10	

Use this space to add any comments or further explanation (optional)

Q3. Your name: _____

Q4. Your e-mail address: _____

Q5. Your main area(s) of expertise

Select/indicate all that apply.

☐ Agriculture

☐ Business and industry

☐ Economics

☐ Nature management

☐ Politics, law and governance

☐ Scientific: biological

☐ Scientific: physical/chemical
(including hydrology, water quality)

☐ Social and cultural

☐ Technology

☐ Other (please specify) _____

Q6. Relevant organizations that you work for/are associated with

Country (or countries) where each organization is based

Multiple answers allowed if you work for more than one organization. If you are not associated with an organization, enter "None" or "Independent".

If you are not associated with an organization, enter your country of residence.

1		
2		
3		

Q7. Type of organization

Select/indicate all that apply to any of your organizations.

☐ Academic or research institute

☐ Non-governmental organization

☐ Governmental organization (local, national or international)

☐ Private sector/business

☐ Other (please specify) _____

Q8. Can we include your organization name(s) and location(s) in a list of survey participants? *Your name and e-mail address will not be published.*

☐ Yes   ☐ No

Q9. Are you interested in helping to refine and prioritize the results from this survey?

Follow-up work will involve rounds of ranking the issues and questions collected by this survey. This work will be conducted by e-mail, so you can complete it in your own time (but by specified deadlines). We anticipate most of this work will take place during summer 2019. Participants will be chosen based on the details provided earlier to ensure representation across sectors and geographic locations. Unfortunately we cannot provide financial compensation for this work, but participants will be listed as authors on any resulting publications. Answering yes to this question does not guarantee participation in this follow-up work, but indicates your interest.

☐ Yes   ☐ No

Q10. Would you like us to send you the outputs from this study by e-mail?

If you answer yes to this question, we will send you a copy of selected reports or papers produced using the survey data. You are welcome to leave this mailing list at any point in the future.

☐ Yes   ☐ No

Thank you for your valuable input

Appendix 1b: Details of survey participants and assessors

Fig. A1 Geographical location of 135 survey participants. Colours group participants by region: Western Europe (*blue*), Maghreb (*orange*), Balkans (*green*), Near East (*yellow*).
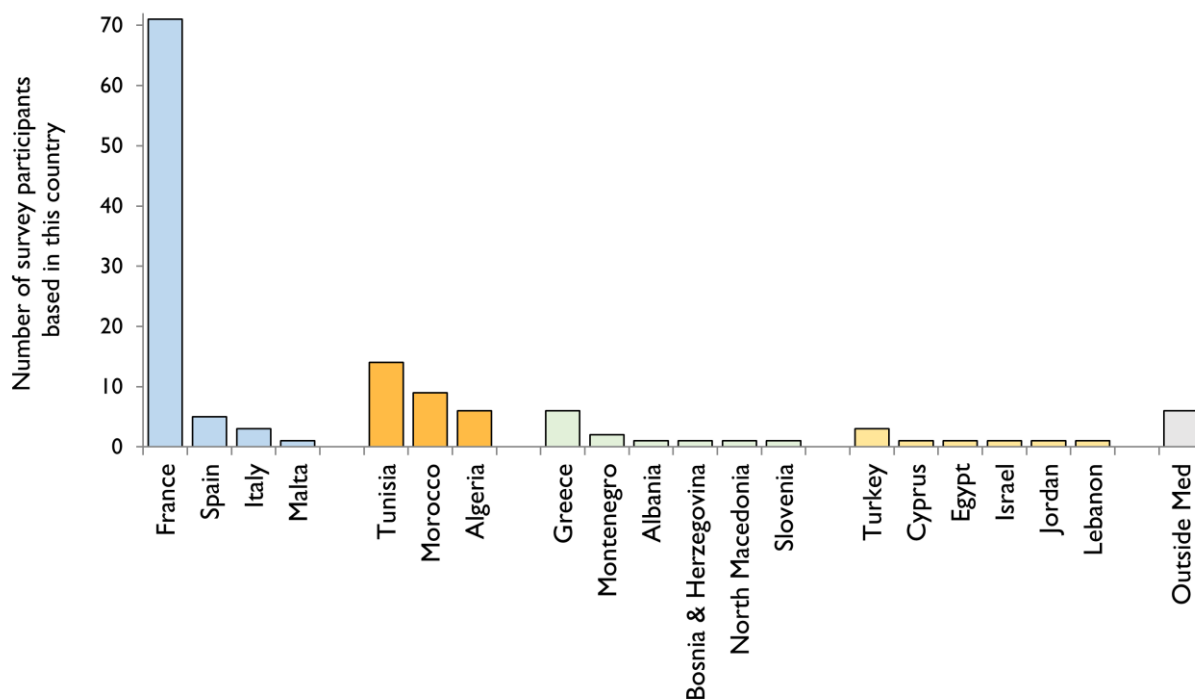

Table A1 Self-defined area of expertise, and affiliation, of the 105 survey participants who completed these questions. A total of 135 participants submitted issues and/or questions. Note that totals exceed 105 because individuals could select more than one area of expertise or affiliation, and because some organisations fit into more than one affiliation category.

(a)	Area of Expertise	No.
	Nature management	62
	Scientific: biological	59
	Politics, law, governance	26
	Agriculture	15
	Social and cultural	14
	Scientific: physical/chemical	13
	Business and industry	5
	Economics and finance	5
	Technology	3
	Other	4

(b)	Affiliation	No.
	Non-governmental organisation	54
	Academic or research institution	40
	Governmental organisation (local, national or international)	27
	Private sector (business)	6
	Other	4

Fig. A2 Geographic expertise of the 30 assessors. Note that total of all bars exceeds 30 because individuals could select more than one region of expertise.
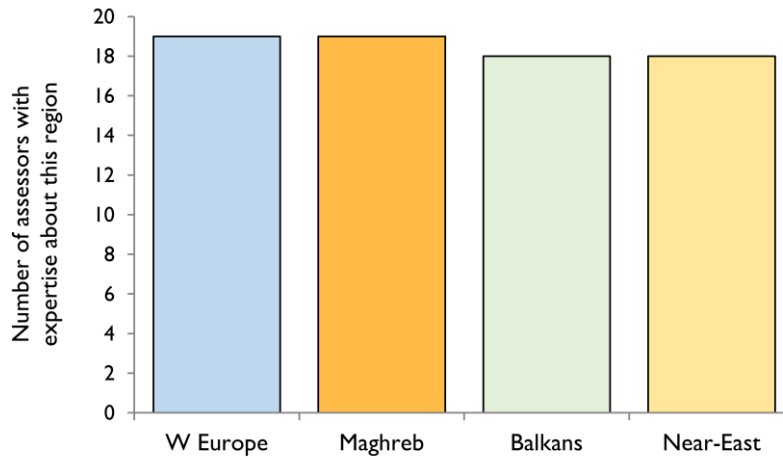

Table A2 Area of expertise, and affiliation, of the 30 assessors. Note that totals exceed 30 because individuals could select more than one area of expertise or affiliation, and because some organisations fit into more than one affiliation category.

(a)	Area of Expertise	No.
	Scientific: biological	20
	Nature management	14
	Scientific: physical/chemical	11
	Politics, law, governance	6
	Social and cultural	5
	Agriculture	2
	Economics and finance	1
	Business and industry	0
	Technology	0
	Other	0

(b)	Affiliation	No.
	Non-governmental organisation	19
	Academic or research institution	17
	Private sector (business)	2
	Governmental organisation (local, national or international)	0
	Other	0

Appendix 1c: Details of initial literature review

Some issues and questions in the initial pools (fed into Round 1 of the assessment) were derived from a literature review, carried out in May and June 2019. Topics with any feasible link to Mediterranean wetlands were added to the initial pools of issues and questions, even if not described in the context of Mediterranean wetlands in the original source. There were three main components to the literature review:

1. Searches in Google, Google Scholar, Google News and Web of Science (databases: BIOSIS Citation Index 1998–present, Current Contents Connect 1998–present) using combinations of the terms "Mediterranean", "wetland*", "environment*", "conserv*", "threat*", "impact*", "futur*" and "emerg*". Note that "Mediterranean" and "wetland*" were not included in all searches, so this process identified topics being discussed in the context of (a) the Mediterranean but not wetlands, (b) wetlands outside the Mediterranean, and (c) conservation and the environment in general. Searches were carried out in English only. Results were sorted by relevance, then the first 20–50 results were screened for any combination of search terms.

2. Systematic screening of titles and abstracts of papers in selected academic journals, and reading full texts to better understand topics where necessary. This screening covered all articles published between January 2018 and June 2019 in:
   - *Biological Conservation*
   - *Conservation Biology*
   - *Current Opinion in Environmental Sustainability*
   - *Frontiers in Ecology and the Environment*
   - *Global Change Biology*
   - *Nature*
   - *People and Nature*
   - *Regional Environmental Change*
   - *Science*
   - *The Solutions Journal*
   - *Trends in Ecology and Evolutio*n
   - *Water*
   - *Wetlands*
   - *Wetlands Ecology and Management*

3. Screening issues and questions identified in the following previous related horizon-scanning and question-setting exercises. Papers published after June 2019 were available as preprints at the time of the literature review.

Brown LE, Mitchell G, Holden J, Folkard A, Wright N, Beharry-Borg N, et al. (2010) Priority water research questions as determined by UK practitioners and policy makers. Sci Total Environ 409:256–266

Coleman JL, Ascher JS, Bickford D, Buchori D, Cabanban A, Chisholm RA, et al. (2019) Top 100 research questions for biodiversity conservation in Southeast Asia. Biol Conserv 234:211–220

Gleason MG, Caselle JE, Caldow C, Galipeau R, Heady W, Laverty C, et al. (2018) Horizon scanning: survey and research priorities for coastal and marine systems of the northern Channel Islands, California. West N Am Naturalist 78:864–878

Kark S, Sutherland WJ, Shanas U, Klass K, Achisar H, Dayan T, et al. (2016) Priority questions and horizon scanning for conservation: a comparative study. PLOS ONE 11:e0145978

Morton SR, Hoegh-Guldberg O, Lindenmayer DB, Olson MH, Hughes L, McCulloch MT, et al. (2009) The big ecological questions inhibiting effective environmental management in Australia. Austral Ecol 34:1–9

Ockendon N, Thomas DHL, Cortina J, Adams WM, Aykroyd T, Barov B, et al. (2018) One hundred priority questions for landscape restoration in Europe. Biol Conserv 221:198–208

Pérez-Jvostov F, Sutherland WJ, Barrett RDH, Brown CA, Cardille JA, Cooke SJ, et al. (2020) Horizon scan of conservation issues for inland waters in Canada. Can J Fish Aquat Sci 77:869–881

Pimm SL, Alibhai S, Bergl R, Dehgan A, Giri C, Jewell Z, et al. (2015) Emerging technologies to conserve biodiversity. Trends Ecol Evol 30:685–696

Prescott GW, Sutherland WJ, Aguirre D, Baird M, Bowman V, Brunner J, et al. (2017) Political transition and emergent forest-conservation issues in Myanmar. Conserv Biol 31:1257–1270

Reid AJ, Carlson AK, Creed IF, Eliason EJ, Gell PA, Johnson PTJ, et al. (2019) Emerging threats and persistent conservation challenges for freshwater biodiversity. Biol Rev 94:849–873

Rudd MA, Beazley KF, Cooke SJ, Fleishman E, Lane DE, Mascia MB, et al. (2011) Generation of priority research questions to inform conservation policy and management at a national level: research questions to inform policy. Conserv Biol 25:476–484

Scottish Water (2016) Horizon Scanning Report 2016. Scottish Water, Dunfermline

Stanley MC, Beggs JR, Bassett IE, Burns BR, Dirks KN, Jones DN, et al. (2015) Emerging threats in urban ecosystems: a horizon scanning exercise. Front Ecol Environ 13:553–560

Sutherland WJ, Adams WM, Aronson RB, Aveling R, Blackburn TM, Broad S, et al. (2009) One hundred questions of importance to the conservation of global biological diversity. Conserv Biol 23:557–567

Sutherland WJ, Alves JA, Amano T, Chang CH, Davidson NC, Finlayson CM, et al. (2012) A horizon scanning assessment of current and potential future threats to migratory shorebirds. Ibis 154:663–679

Sutherland WJ, Aveling R, Brooks TM, Clout M, Dicks LV, Fellman L, et al. (2014) A horizon scan of global conservation issues for 2014. Trends Ecol Evol 29:15–22

Sutherland WJ, Bardsley S, Bennun L, Clout M, Côté IM, Depledge MH, et al. (2011) Horizon scan of global conservation issues for 2011. Trends Ecol Evol 26:10–16

Sutherland WJ, Bardsley S, Clout M, Depledge MH, Dicks LV, Fellman L, et al. (2013) A horizon scan of global conservation issues for 2013. Trends Ecol Evol 28:16–22

Sutherland WJ, Barnard P, Broad S, Clout M, Connor B, Côté IM, et al. (2017) A 2017 horizon scan of emerging issues for global conservation and biological diversity. Trends Ecol Evol 32:31–40

Sutherland WJ, Broad S, Butchart SHM, Clarke SJ, Collins AM, Dicks LV, et al. (2019) A horizon scan of emerging issues for global conservation in 2019. Trends Ecol Evol 34:83–94

Sutherland WJ, Broad S, Caine J, Clout M, Dicks LV, Doran H, et al. (2016) A horizon scan of global conservation issues for 2016. Trends Ecol Evol 31:44–53

Sutherland WJ, Butchart SHM, Connor B, Culshaw C, Dicks LV, Dinsdale J, et al. (2018) A 2018 horizon scan of emerging issues for global conservation and biological diversity. Trends Ecol Evol 33:47–58

Sutherland WJ, Clout M, Côté IM, Daszak P, Depledge MH, Fellman L, et al. (2010) A horizon scan of global conservation issues for 2010. Trends Ecol Evol 25:1–7

Sutherland WJ, Clout M, Depledge M, Dicks LV, Dinsdale J, Entwistle AC, et al. (2015) A horizon scan of global conservation issues for 2015. Trends Ecol Evol 30:17–24

UNEP (2012) 21 issues for the 21st century: result of the UNEP foresight process on emerging environmental issues. United Nations Environment Programme, Nairobi

UNEP (2017) Frontiers 2017: emerging issues of environmental concern. United Nations Environment Programme, Nairobi

Appendix 1d: Additional details of data processing

Processing issues

After Round 1 and Round 2, issues were ranked based on their median score for L × I and L × I × N (where L = Likelihood, I = Impact, N = Novelty). Raw scores were converted to Z scores, which can be meaningfully aggregated across participants who have provided sets of scores with different means and variances. Z scores account for subjective differences in scoring, by considering only the relative rank of an issue within each assessor and not its absolute value (Wintle et al. 2017).

Z scores were generated as follows:

1. Calculate raw L × I and L × I × N scores for each issue-assessor combination (so in Round 1 with 236 issues, each assessor has up to 236 L × I scores and up to 236 L × I × N scores). If one or all of these components (L, I or N) was not scored for a particular issue, no raw score was generated.

2. Convert each raw score into a Z score: $Z = (R - \mu)/\sigma$

   where R = raw score, μ = mean of all raw scores for an assessor, σ = standard deviation of all scores for an assessor.

After Round 1, the shortlist was composed of 132 issues: the top 50 critical issues (based on median Z score for L × I only) + out of the remaining issues, the top 50 overlooked issues (based on median Z score for L × I × N) + 32 new issues suggested in Round 1.

After Round 2, the shortlist was composed of 50 issues: the top 25 critical issues (based on median Z score for L × I only) + out of the remaining issues, the top 25 overlooked issues (based on median Z score for L × I × N). New issues were not automatically added to the shortlist here, but were presented separately as "contender" issues, along with 10 issues that just missed selection based on their scores and 13 issues that had been "saved" by assessors in Round 2.

Processing questions

After each round, votes were tallied and the top N% of questions within each theme were retained, where N was chosen to generate a reasonably sized shortlist to carry forward.

After Round 1, 170 questions were shortlisted: the top 50% of questions within each of 18 themes. In the case of tied votes, we kept the minimum number of questions that meant at least 50% were retained per theme (e.g. in a theme with 20 questions and Questions 9, 10 and 11 receiving the same number of votes, the top 11 questions were shortlisted).

After Round 2, 52 questions were shortlisted: the top 25% of questions within each of 13 themes. In the case of tied votes, we kept the minimum number of questions that meant at least 25% were retained per theme. New questions were not automatically added to the shortlist here, but were presented separately as "contender" questions, along with 6 questions that received more than 50% of the votes of the most popular question per theme (but had not already been included) and 19 questions that had been "saved" by assessors in Round 2.

Merging issues and questions

After each assessment round, some redundant issues and questions were merged. When questions were considered similar enough to be merged, we also merged the votes. If any major edits changed the essence of an issue or question, it was added as a new item.

Revising shortlists after Round 3

Revision of the shortlist following Round 3 of the expert assessment (online discussion) was based on consensus across all three rounds, but with greater weighting towards responses in Round 3. In most cases, there was a clear consensus in Round 3 to keep, reject or add issues/questions. The focused discussion identified some conceptual disagreements that led to the removal of some broader and redundant issues/questions.

Some issues/questions were promoted into the shortlists based on votes made in Round 3, with priority in the case of ties given to "contender" issues/questions (that had just missed inclusion based on scores/votes in Round 2, received votes to be saved in Round 2, or had been suggested as new issues/question in Round 2).

Reference

Wintle BC, Boehm CR, Rhodes C, Molloy JC, Millett P, Adam L, et al. (2017) A transatlantic perspective on 20 emerging issues in biological engineering. eLife 6:e30247