Received: 19 December 2019 | Revised: 27 March 2020 | Accepted: 31 March 2020

DOI: 10.1111/csp2.206

Conservation Science and Practice
A journal of the Society for Conservation Biology
Open Access
WILEY

PERSPECTIVES AND NOTES

A transdisciplinary approach to a conservation crisis: A case study of the Eurasian curlew (*Numenius arquata*) in Ireland

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Abstract

In this article, we build on a growing literature of examples of transdisciplinary approaches to illustrate the catalysts and outcomes of a stakeholder-driven process to conservation practice. We illustrate this using the case of one of Europe's most rapidly declining bird species, the Eurasian curlew (*Numenius arquata*). As part of the response to its continuing decline, a stakeholder-driven workshop was held in Ireland in November 2016, bringing together over 80 stakeholders from a range of governmental, non-governmental, and private organizations responsible for or interested in curlew conservation and management. This innovative workshop sought to formulate ideas and support the implementation of actions from stakeholders themselves on how to halt further losses of curlews, within the current legislative framework. Four years on, many of the short- and medium-term actions identified during the workshop have been implemented jointly by stakeholders. However, curlew recovery will require continued communication and meaningful engagement with all relevant stakeholders together with increased government support underpinned by increased public awareness and ownership of the curlew's plight. Ultimately, many stakeholders will measure the success of curlew conservation in Ireland by the long-term viability of the breeding population.

KEYWORDS

agriculture, conservation, ground nesting-bird, land-use, peatland

1 | INTRODUCTION

Conservation is an activity that inherently connects human societies and natural systems (Mishra, Young, Fiechter, Rutherford, & Redpath, 2017). Although the framings of conservation have changed over the years, the prevailing view over the last decade or so is one which emphasizes the need for approaches that improve the interactions between people and nature (Mace, 2014). This has led to calls for collaboration between relevant

disciplines from the natural and social sciences to inform conservation action in a more integrated way (see Bennett et al., 2017; Mascia et al., 2003), as well as integration between science and civil society actors (Torkar & McGregor, 2012). This approach can be described as transdisciplinarity, or the approach of working collaboratively across scientific disciplines and with other societal actors to generate new and more holistic knowledge on societal problems and develop solutions together (Hadorn, Bradley, Pohl, Rist, & Wiesmann, 2006; Reyers et al., 2010; Young & Marzano, 2010). This has resulted in a movement in conservation to try and involve stakeholders earlier and to a greater degree in conservation interventions (Ainsworth, Redpath, Wernham, Wilson, & Young, 2020; Redpath et al., 2017; Reed, 2008; Young et al., 2016). Many examples of collaborations with stakeholders exist and a large number of principles, guides, and toolkits can be used to better engage with stakeholders (e.g., Mishra et al., 2017; Wondolleck & Yaffee, 2000). When stakeholder-driven processes do occur, it is essential to explore the catalysts behind these processes, and the actions derived from them within socio-political boundaries, to determine the effectiveness of such transdisciplinary processes (Muñoz-Erickson, Aguilar-González, Loeser, & Sisk, 2010). Few studies, however, report on catalysts and progress. This paper adds to this literature by outlining the outcomes of a stakeholder-driven process to conservation practice, using the example of a workshop focused on the Eurasian curlew (*Numenius arquata*) conservation in Ireland in 2016. The objectives of this study were to (a) understand the catalysts that led to the workshop in Ireland, (b) capture and monitor the actions identified by stakeholders to address the decline in curlews, (c) identify barriers, as perceived by stakeholders, to curlew conservation, and (d) explore the progress of actions and the potential for stakeholder-driven processes to stimulate conservation actions.

Curlews have seen a continued decline in population and range across Europe, but particularly in Ireland, where there has been a population loss of 97% in the last 30 years (O'Donoghue, Donaghy, & Kelly, 2019) and a range loss of 78% (Balmer et al., 2013). Curlews demonstrate breeding site fidelity and in Ireland tend to utilize breeding habitat types that combine a mixture of marshy or peatland habitats with marginal farmland habitats (Bracken, McMahon, & Whelan, 2008; Colhoun, Mawhinney, & Peach, 2015). The causes of breeding curlew declines are well reported (e.g., Franks, Douglas, Gillings, & Pearce-Higgins, 2017). Habitat loss and degradation as a result of agricultural intensification, land drainage and afforestation, predation, and human disturbance have been identified as the threats to breeding populations in Europe (European Commission, 2007). In Ireland, peatland habitats have declined by 47% due to peat extraction (Malone & O'Connell, 2009), which together with burning of peatland prior to harvesting, may cause unacceptably high levels of disturbance to breeding pairs. Large sections of raised peatlands in Ireland have been harvested since the mid-1940s although this is to be phased out by 2030. Agricultural intensification is leading to marginal areas being improved through drainage and reseeding, producing areas of grassland that are of limited value to breeding curlew (Colhoun et al., 2015). Abandonment of traditional land management practices poses a threat, particularly within economically marginal farming regions (Henle et al., 2008). Further habitat loss and fragmentation occurs on marginal farmland and peatland when afforestation occurs (Malone & O'Connell, 2009). The 2007–2011 Bird Atlas highlighted the recent severe decline of the curlew (Balmer et al., 2013). Despite this scientific knowledge on the causes of curlew declines, their loss in Ireland continues, with stakeholders increasingly concerned that breeding populations of curlew are heading for extinction (Colhoun & Cummins, 2013; O'Donoghue et al., 2019). The National Parks and Wildlife Services of the Department of Culture, Heritage and the Gealteacht has the responsibility for curlews in Ireland but they require independent landowners and other government departments, such as the Department of Agriculture, Food, and the Marine to implement conservation action for the curlew.

Since 2010, BirdWatch Ireland, an environmental NGO, lobbied for a government response and publicized the plight of curlews, and undertook monitoring and conservation management with funding from the European Regional Development Fund (ERDF) (e.g., Donaghy, 2014). The National Parks and Wildlife Service (NPWS), that manages the Irish State's nature conservation, coordinated the first national survey of breeding curlews between 2015 and 2017 (O'Donoghue et al., 2019). During this time, BirdWatch Ireland, environmental groups and other organizations including Bord na Móna (BnM) (a semi-state company whose businesses include biomass procurement and supply, power generation [peat based and renewable], waste recovery, domestic fuel products and professional and consumer horticulture products), jointly discussed undertaking positive action for breeding curlews. Subsequently, to raise awareness of the decline in curlews across Britain and Ireland, a British producer and writer (Mary Colwell) undertook a 500-mile walk (Curlew Media, 2016), during which funds were raised toward organizing two workshops, one of which was in Ireland. This workshop, held in Higginstown (Co. Westmeath, Ireland) in November 2016 was

organized by Mary Colwell along with BirdWatch Ireland (Anita Donaghy) and University College Dublin (Barry McMahon) with support from Irish National Parks and Wildlife Services (Barry O'Donoghue) with the view to invite all organizations or individuals (e.g., active individual conservationists) with an interest or who could assist in curlew conservation.

1.1 | The workshop and interviews

To understand the stakeholder-driven process to address the curlew decline, we used a two-stage approach of (a) compiling the conservation actions identified by the participants of the workshop, and (b) carrying out subsequent interviews with key informants.

The workshop brought 80 stakeholders from over 12 organizations from the government, conservation, forestry, NGOs, agriculture (both individual farmers and Teagasc—the Agriculture and Food Authority, which also provides a research and a farmer advisory service), energy production, and academia together and provided a forum for discussions on the future conservation of curlews. While this was not a "usual" gathering, the stakeholders at the workshop were representative of the need for the interested personnel in curlew conservation in Ireland to organize their initial position as they represented various organizations with different approaches to conservation, for example, NGOs, government departments and interested individuals. The workshop was chaired by an independent ecological consultant (Alan Lauder) and started with plenary presentations, setting the scene in terms of the curlew biology, status, and drivers of decline. The participants were then encouraged to join working groups where they identified possible actions jointly. These actions were then presented in plenary by the rapporteurs in each working group, discussed in plenary and agreed upon jointly by stakeholders at the workshop as actions needed to address the curlew decline. Some actions were identified in more than one working group. No actions identified in the working groups were dismissed—as such the aim of the workshop was to compile and agree on actions, rather than prioritize or rank them. Juliette Young and Barry McMahon transcribed the actions identified, and synthesized them according to the period in which they could be achieved (short, medium, and long term). The report was disseminated to workshop participants a week after the workshop to invite any comments or suggestions. None were received and the report was finalized. The outcomes of the workshop were the development of cross-stakeholder jointly agreed conservation actions, and that the government department responsible would be asked to convene a Government Task force for the conservation of curlews in Ireland.

Following the workshop, participants that had attended the workshop were contacted by Amy McCluskey. We used key informant sampling (Young et al., 2018) to target experts in curlew conservation from organizations with different roles. We selected individuals based on having (a) attended the workshop and (b) demonstrated that they were already undertaking land management or conservation actions for curlews. The stakeholder organizations contacted included Bord na Móna, Teagasc, Department of Agriculture Food and the Marine, National Parks and Wildlife Service, Irish Peatland Conservation Council, Curlew Media, BirdWatch Ireland & The Royal Society for the Protection of Birds. A total of 10 stakeholders were interviewed, all of whom would be considered experts in their fields. Attempts were made to establish contact with a representative of the Turf Cutters and Contractors Association (TCCA) as well as the Irish Farmers Association (IFA). While an initial agreement was received from the IFA no further information was given from their representative following a subsequent email. A representative of Teagasc, the Irish farmer research and advisory body, did, however, take part in the interview. No response was received from the attempts made toward to TCCA. The stakeholder breakdown can be found in Table 1.

The interviews took place from 16th March to 7th April 2017. Of the 10 interviews, eight were conducted over the phone, one was face to face and the last was completed online. All interviewees were made aware of the purpose of the study, its methodology and intended use of the research. All interviewees were asked to complete a confidentiality and consent form prior to the interview, and data were analysed and reported accordingly. All interviewees received a copy of the manuscript once completed to comment on and approve. A suggested time of no more than 30 minutes was given to each stakeholder, although this varied depending on the stakeholders' availability and desire in wanting to talk about the curlew further. The study was carried out using a semi-structured interview process with an interview

TABLE 1 Distribution and codes of interviewees (used to anonymize responses), according to background

Interview category	Interviewee codes
Bird conservation	SH6, SH8, SH9, SH10
Non-governmental organizations	SH7
Government agencies	SH2, SH3, SH4
Advisors	SH5
Corporate landowners	SH1

guide consisting of 20 broad and specific questions (see Appendix SA1 in Supporting Information for the interview guide). All interviews were transcribed verbatim in Microsoft Word 2010. For the analysis of the interviews, Adobe Acrobat 9.0 Pro was used to scan both the individual interview transcripts and the dataset as a whole to identify significant themes and issues within it. Establishing common themes and opinions within the interviews created percentages of catalysts, barriers or issues of most significance to the interviewees.

1.2 | Catalysts for the stakeholder workshop

The main reason for attending the workshop for eight interviewees was the conscious need to conserve the species (see Figure 1). One interviewee stated that *"It's a social duty* [to attend the workshop] *rather than a work instruction to take part. The reasons are more altruistic"* (SH3). Another interviewee (SH1) felt it was "*the right thing to do*" and "*felt a responsibility that we should be part of it and we feel like we have a lot to give, but that we also have a lot to learn as well."* Seven interviewees highlighted this need to gather more information, particularly on how to manage the curlew population. As one interviewee (SH7) stated, *"I think it was a really important event because it was the first time everybody was brought together to talk about this. [...] there was a serious lack of communication before that."* Another interviewee also commented on their predictions of how the next generation would look back and judge the situation as a catalyst: *"We have to do something because future generations will never forgive us"* (SH1). Other catalysts highlighted by interviewees included awareness raising such as Mary Colwell's walk and the fact that it was seen as a conservation priority, networking, support to other groups, and a general interest in the decline of farmland birds (see Figure 1).

1.3 | Actions identified by stakeholders to address the curlew decline in Ireland

The short-, medium-, and long-term actions jointly identified by stakeholders during the workshop are listed in Table 2, not in priority order. The short-, medium-, and long term are defined by BM and JY as less than 2 years, between 2 and 5 years and more than 5 years. The text in italics after each action describes the extent to which the action has been addressed since the workshop, as perceived by the authors.

1.4 | Perceived barriers to the conservation of curlews

The main barrier to curlew conservation, as with many issues around conservation, was identified by nine interviewees as the limited availability of funding (see Table 3). Funding was seen as a restriction in moving forward by four out of the 10 interviewees, especially when discussing landowner involvement in management: *"Farmers will be involved if there is appropriate funding and information available to them. Resources I think is the*

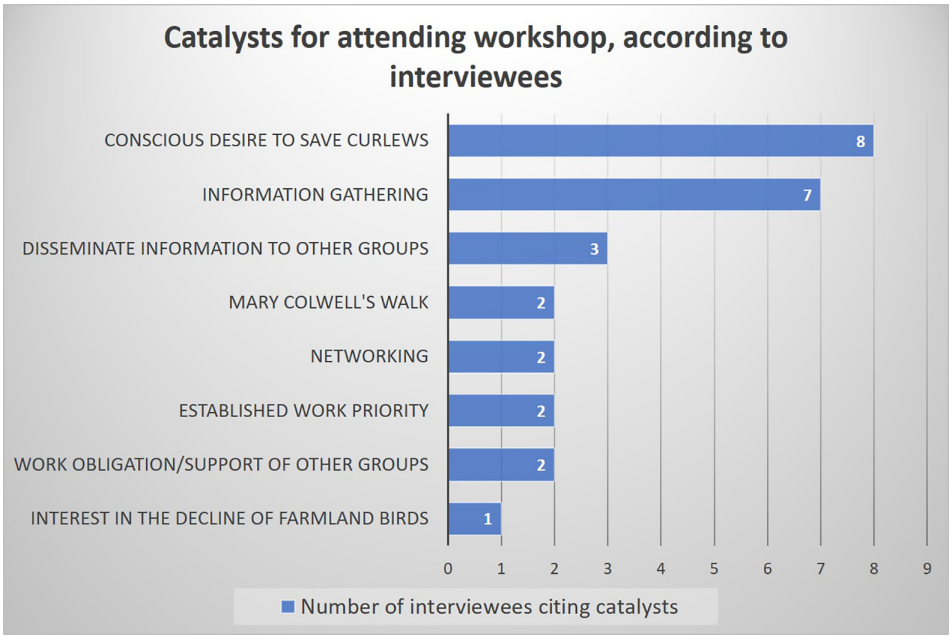

FIGURE 1 The catalysts given by interviewees for their decision to attend the Curlew workshop

TABLE 2 Short-, medium- and long-term actions identified by workshop participants for curlew conservation, together with progress toward those actions

Timeframe	Actions identified	Progress towards achieving actions
Short-term actions for the curlew conservation in Ireland that could be actioned within 2 years.	Set up a task force to coordinate future action for the conservation of curlew.	Established in February 2017 and final recommendations presented in September 2019. (https://www.chg.gov.ie/app/uploads/2019/09/curlew-task-force-recommendations.pdf).
	Communicate curlew locations to National Parks and Wildlife Service (NPWS) regional staff and other government local staff and advisors to allow direct contact with farmers with curlews on their land.	Carried out as part of the NPWS Curlew Conservation Program, [a] by Teagasc and other agricultural advisors and by BirdWatch Ireland as part of the Conservation Across Borders for Biodiversity (CABB) project (2018–2022) and the Curlew European Innovation Project (EIP) (2018–2021). In conjunction with NPWS, the Department of Agriculture, Food and the Marine sent a text message to farmers within Curlew breeding areas to let them know that they were eligible for priority entry to Green, Low-carbon, Agri-Environmental Scheme (GLAS) on the basis of breeding curlew.
	Encourage NPWS local staff and agricultural advisors to make farmers with curlews on their land aware, and encourage uptake of GLAS curlew measure and other bespoke agreements.	Done by Teagasc and other agricultural advisors for GLAS and BirdWatch Ireland in the border counties as part of the Halting Environmental Loss Project (HELP)[b] (2011–2014) and the CABB project (2018–2022). A results-based measure was also tested through the Results-based Agri-environment Payment Scheme (RBAPS) project in the Shannon Callows (2015–2018), funded by the European Union.[c] Local NPWS and the NPWS Curlew Conservation Program, also started to carry out this role in 2017. In conjunction with NPWS, the Department of Agriculture, Food & the Marine sent a text message to farmers within Curlew breeding areas to let them know that they were eligible for priority entry to GLAS on the basis of breeding Curlew.
	Develop a concise information sheet aimed at farmers in clear, jargon-free language, containing information on the urgency of the conservation status of curlews, what habitats they need, where they occur, and what farmers can do to support curlews on their land or encourage the curlew recovery.	Had already jointly been produced by RSPB and BirdWatch Ireland as part of the HELP project.[d] Two information sheets have been produced as part of the Curlew Conservation Program, one for the general public and one for landowners and farmers. A best practice handbook was also produced as part of RBAPS.
	Encourage interactive and positive communication with farmers on the curlew conservation status and approaches to curb the loss of curlews through articles in the media, interaction with farmers' unions and	Carried out both prior to and after the workshop by BirdWatch Ireland through press releases and articles in the farming press. Many stakeholders who attended the workshop routinely have meetings with landowners and farmers. The curlew has and

(Continues)

TABLE 2 (Continued)

Timeframe	Actions identified	Progress towards achieving actions
	agricultural advisers, information sheets and targeted, specific and well-timed events.	will continue to be discussed specifically on a number of occasions (e.g., Curlew Conservation Program, RBAPS, Governmental/Farming Organizations meetings, GLAS, National Ploughing *Championships*, *local meetings*, etc.). Two specific sub-groups on the Curlew Task Force (a) Farming and Agricultural Advisory and (b) Curlew and People (i.e., communications) directly produced recommendations relating to this action point. One to one contact with farmers with breeding curlew is maintained as part of the CABB project and curlew EIP.
	Carry out targeted and systematic predator control where breeding curlews are present, for example, developing the Ballydangan Red Grouse project model.	Already carried out, to an extent, as part of the HELP project. The curlew conservation Program employs dedicated est protection efforts to manage predation risk. The curlew EIP is developing a training program for farmers and landowners in predator control to benefit breeding curlew and is trailing this measure with a view to including a predator control measure in the next rural development program.
	Raise awareness of the curlew situation and encourage partnership working with Turf Cutters and Contractors Association (TCCA), and Irish Farmers Association (IFA), on curlew conservation.	The TCCA and IFA were invited to participate in and contribute to the Curlew Task Force. The Curlew Conservation Program interacts with turf cutters and to date has had positive and successful engagement at curlew breeding sites in turbary areas. BirdWatch Ireland, the Irish Natura And Hill Farmers Association and the Irish Grey Partridge Trust held initial discussions with the TCCA in relation to an application to the DAFM EIP for curlews; but ultimately, the turf cutting aspects of this project were not pursued on the advice of the TCCA.
Medium-term actions for curlew conservation in Ireland—actions that could be carried out within 2–5 years	Develop a curlew recovery management plan and potentially site-based management plans.	The Curlew Task Force has outlined national recommendations,[e] however, more detailed site plans are required.
	Develop locally-led schemes promoting engagement with all relevant stakeholders. The curlew conservation Program, together with the EIP, which commenced in 2018, are important projects in this respect.[f]	The Curlew EIP underway and is trailing a specific results-based approach for Curlew AE measures. Separately, engagement and knowledge transfer between landowners and NPWS Curlew Conservation Teams is being assessed as part of Masters Research Project in University College Dublin. The Curlew Conservation Program is active in nine of the most important areas for breeding Curlew across Ireland, with core values of local action, local championing and local empowerment involving landowners and local communities as well as local Curlew Action Teams.

TABLE 2 (Continued)

Timeframe	Actions identified	Progress towards achieving actions
	Enforce existing conservation and domestic turf cutting laws.	Some progress. The minister for culture, heritage and the Gaeltacht has brought a number of cases to court in relation to illegal turf cutting.
	Encourage habitat creation for curlews in key areas.	This is one of the objectives of the curlew conservation Program, with a number of sites having been "enhanced" through scrub creation, rush cutting, scrape creation, liming and predation exclusion.
		Habitat creation and management is being undertaken as part of the CABB project and the curlew EIP, with management agreements in place with two landowners with curlew in Donegal Galway and Leitrim. Other work is planned with specific capital works only agreements in CABB.
	Encourage more public support and engagement in curlew conservation. For example, identifying BnM peat bogs with curlews.	BnM worked with BirdWatch Ireland for a number of years to identify and protect breeding curlews on their land. The Curlew Task Force had a sub-group on People and Curlew. Literature has been produced by NPWS, The Irish Peatland Conservation Council (IPCC), bird watch Ireland (BWI), Golden Eagle Trust (GET), Mary Colwell, etc. Posters, car stickers, World Curlew Day (21st April), local school and community talks by Curlew Conservation Program champions have also contributed to this action. There has been widespread local, national, and social media attention concerning Curlew conservation in Ireland. Curlew structures have been created as part of the Curlew Conservation Program for positioning at towns/villages in remaining Curlew "strongholds".
	Create and train specialist advisers or "champions" to engage with farmers, other landowners and local communities to promote curlew conservation.	The frontline personnel of the Curlew Conservation Program have pioneered efforts throughout much of Ireland and have gained significant and important experience since 2017. However, the one season contracts potentially create an issue with continuity.
	Examine options for reconnecting curlews with Irish heritage and folklore, re-establishing the curlew as part of Ireland's history.	Some progress. This is being looked at as part of a masters project associated with the Curlew Conservation Program.
Long-term actions for curlew conservation in Ireland –actions that could be carried out beyond 5 years	Examine climate change and carbon storage policy to support conservation of bogs—e.g., encouraging carbon storage to be focused on bogs, not forests.	The Climate Action Plan[g] contains a number of actions relating to valuing and restoring bogs in terms of carbon storage—e.g., there is a commitment to restore 22,000 ha of designated raised bogs and Bord na Móna will look at the restoration capacity of sites under their management.

(Continues)

TABLE 2 (Continued)

Timeframe	Actions identified	Progress towards achieving actions
		BirdWatch Ireland undertaking blocking of drains on 500 ha of blanket bog in the Ox Mountains, co. Sligo as part of CABB.
	Develop long-term Agri-environment policy balancing production focus with public good and other values. This could include landscape scale management to encourage fledged curlews to come back to their original habitat.	NPWS and DAFM are working closely on the formulation of the next CAP Strategic Plan (CSP). A specific submission for curlew was made to the Prioritized Action Framework and the CSP public consultation.
	Develop government policies specifically aimed at protecting curlew sites from land drainage, forestry and wind farm developments.	Curlew locations are prioritized for Agri-environment schemes and conservation action and are taken into account as part of a protocol relating to forestry. However, further progress needs to be made on both to secure protection from both agriculture and forestry land use change.
	Examine peat extraction techniques on privately owned bogs.	The Curlew Conservation Program has had a number of positive engagements with local turf cutters in safeguarding nests, but there is no national policy or protocol in relation to how such cases are to be dealt with. It would be useful to have turf cutters contribute to creating habitat on degraded sites or even simply returning the top sod face up after cutting.
	Examine potential for alternative fuel sources to cutting turf, for example, providing appropriately sited and sustainably managed conifer forestry patches to landowners.	No progress.
	Encourage research on curlew population dynamics at site level, including examining the drivers of curlew loss between hatching and fledging.	The output from the research on the Curlew Conservation Program is due in 2020.

[a]https://www.npws.ie/farmers-and-landowners/schemes/curlew-conservation-programme.
[b]https://www.rspb.org.uk/our-work/conservation/projects/halting-environmental-loss-project/.
[c]https://rbaps.eu/pilot-areas/rbaps-measures-in-ireland/shannon-callows/breeding-waders/.
[d]https://www.birdwatchireland.ie/LinkClick.aspx?fileticket=u89ss%2BccNPI%3D&tabid=1106.
[e]https://www.npws.ie/sites/default/files/general/curlew-task-force-recommendations.
[f]https://www.agriculture.gov.ie/press/pressreleases/2017/december/title,113634,en.html.
[g]https://www.dccae.gov.ie/en-ie/climate-action/publications/Pages/Climate-Action-Plan.aspx.

biggest stumbling block" (SH5). Other funding constraints relating to farmers' involvement related to dissemination of information: "*if you don't have the money you can't get the people on the ground providing the advice*, *making contact with farmers and continuing to get people involved"* (SH8). It is important to note that since the workshop, the government have given some funding to the Curlew Task force (completed in September 2019 see recommendations (https://www.npws.ie/sites/default/files/general/curlew-task-force-recommendations.pdf and other information https://www.npws.ie/research-projects/animal-species/birds/curlew-task-force) and the Curlew Conservation Program (https://www.npws.ie/farmers-and-landowners/schemes/curlew-conservation-programme).

Difficulty in overcoming habitat loss and maintaining good quality habitats on curlew sites into the future was the second most commonly identified barrier, highlighted by four interviewees. Restrictions on farmers planting

TABLE 3 Barriers to curlew conservation as perceived by the ten interviewees

Perceived barriers to curlew conservation	Percentage of interviewees who mentioned barrier (%)
Lack of funding	31
Habitat loss	14
Government agencies processes	10
Lack of or poor communication	10
Time commitment	7
Lack of research and knowledge	7
Lack of public interest and support	7
Reputations	7
Lack of policing	4
Predation on curlews	3

trees due to curlew presence were mentioned as an obstacle due to its impact on farmers' rights: *"It's the ultimate restriction not being able to do what you want with the land*; *it's about tweaking management*, *as opposed to a direct sort of denial of land use"* (SH4). One interviewee commented on how *"It will be relatively easy to incentivize positive work (provided the financial and ecological resources are available) but it will be rather more difficult to turn around policies and markets that have led to and continue to destroy habitat"* (SH2). Three interviewees stated that the lack of support from government agencies surrounding legislation was a major barrier to overcome. The same number also highlighted a lack of communication and openness between different agencies. Other barriers included lack of knowledge and research, poor public awareness or support, and the perceptions or reputations of stakeholders limiting co-operation between groups (see Table 3).

When asked why they thought it had taken so long to react to declining curlew numbers, three interviewees mentioned government policies and regulations: *"Ireland is slow to fulfil its obligations in relation to halting the decline of biodiversity*. *It is probably not as high profile as some of our other environmental obligations such as those in relation to water quality and greenhouse gas emissions"* (SH5). Another interviewee commented on the lack of political will to conserve biodiversity: *"In a way it's probably that they feel people are concerned about wildlife but not concerned enough to not vote for somebody for not acting to protect curlew"* (SH6). These views were reflected by another interviewee: "*They should have been protecting those birds all along*, *but there is no political will there [...] This has to start at the top*, *if there's not* [political will] *then you're just wasting your time"* (SH10). Many interviewees believed that this lack of political will explained the broader lack of engagement in management strategies and the lack of public awareness and engagement around curlew conservation. One interviewee stressed that *"Everyone likes to be talked to and get their opinion [...] and nobody spoke to anyone on the ground so straight away it was doomed"* (SH1). Public engagement was the only way forward according to one interviewee: *"My big point of view on curlew and any conservation on peatlands is from the bottom up is the way to go and not from the top down and try to push for that and get everyone [...] to understand that"* (SH1). Engaging early on with landowners was a proven approach according to one interviewee: *"The models elsewhere particularly in the Burren have shown that community engagement [...] is a proven model for fostering different approaches and different thinking*. *It can be applied across different areas*, *it's a model of listening and co-operation and working together*. *It's a completely logical approach"* (SH4).

Interviewees also referred to the wider public attitude toward biodiversity loss and management of species in Ireland stating that it was "*a reflection of our society that [...] we're bothered when it gets to crisis level but we're not prepared to put resources into things that are not critically endangered"* (SH6). Another put it down to the societal worth of curlew conservation: *"That's what it's all about*, *how much are the curlew worth*, *how much are trees*, *cattle or sheep worth? It boils down to those questions*. *Unless society decides that the curlew is more important in that area than sheep than cattle"* (SH3). An area of discussion among interviewees was why it took an outside influence such as Mary Colwell to *"probe our conscience"* (SH3).

2 | DISCUSSION

The fact that all short-term, and many of the medium-term, actions identified by workshop participants have been enacted since the workshop took place is somewhat encouraging for future conservation action for curlews in Ireland. The catalysts leading to the workshop are also a sign for hope. Stakeholders felt a social duty and responsibility in managing the species, and were supportive of the need and desire to share and gather more information and knowledge on how to manage the curlew effectively. As such, the stakeholders in this transdisciplinary approach were similar to "stakesharer," as coined by Torkar and McGregor (2012), namely a group of people sharing "*ideas*, *solutions*, *threats and opportunities as they try to stake out their collective response to human–nature*

interface problems" (pp. 65). Despite the different backgrounds of interviewees, there was agreement on how to move forward with the management process in terms of short-, medium-, and long-term actions for curlew conservation in Ireland.

There are, however, a number of caveats around this particular situation that need to be highlighted before being able to predict whether the stakeholder-driven process we describe in Ireland is likely to be more successful in terms of the long-term conservation of curlews than past initiatives and programs—or applicable to other situations. First, it is important to appreciate that this situation was context-dependent by virtue of the people involved (and their values), and the landscape in which the curlew populations occur—which will not necessarily be the same as the situation in other countries or for other species. One notable aspect in this context which made the identification of joint actions as part of only one workshop possible, was that there was no conflict between stakeholders over the conservation of curlews. As such, stakeholders were able to suggest and agree on solutions more easily than in other more contentious conservation situations (e.g., Redpath et al., 2013). Second, although the above actions were considered by stakeholders and interviewees as "last minute" and should have been addressed before the population had declined to such a small size, there have been a large number of initiatives and programs undertaken in Ireland to help conserve curlews—these were the basis on which the walk and the workshop happened and should be acknowledged. Even if the stakeholders did not refer to these directly, the publication and communication around them would have influenced the views of the stakeholders before they got to the workshop. Similarly, it is difficult to single out the workshop in terms of evaluation of progress, as the workshop is part of a range of initiatives aiming to conserve curlews. Third, many interviewees stressed the need for the momentum to be maintained to achieve long-term actions, emphasizing continued communication, meaningful engagement, and collaboration with all relevant stakeholders, including farmers and landowners, and increased funding to be made available by the Irish government—fueled by increased public awareness and psychological ownership of the curlew. This indicates that a number of criteria need to be fulfilled for these actions to be implemented. Whether the 5-year timeframe is feasible considering the current conservation status of the curlew is debatable. Finally, as highlighted in the introduction, the role of policies, such as the Common Agricultural Policy cannot be minimized in the conservation of curlews. Addressing these was not the aim or within the breadth of the workshop—which aimed instead to set the ground for discussion and future action. The expectations of the workshop, and the timeframe chosen for the actions resulting from it, highlight the trade-offs between science and policy, including the different values guiding policy actions, and the constraints in terms of timeframes that science and policy operate in (Sarkki et al., 2015; Watt et al., 2019; Young et al., 2014).

A key question that emerges from our example is lessons learned on how to get relevant government bodies and other stakeholders to engage jointly and rapidly to address conservation issues. In the case of curlew conservation in Ireland, there were a number of catalysts that led to stakeholders attending the workshop and identifying joint actions. The catalysts were linked to the reasons behind the steep decline in curlews, namely, apathy and a lack of appropriate information and communication to the influential stakeholders, but also powerful policies designed to promote agricultural and rural development potentially to the detriment of curlews, as mentioned above. Apathy and the lack of information was addressed by a number of factors, including a greater awareness of the immediacy and extent of the curlew decline (through scientific input and media attention)—and the realization that many stakeholders were passionate about curlews. The level of apathy or engagement varied according to different groups of stakeholders—as can be the case in such processes (Ainsworth et al., 2020), and demonstrate the importance of the engagement of key stakeholders in such processes, including the need for other options should representatives of such influential groups not be engaged. In light of the importance of farming and turf cutting on curlew populations, it was perhaps disappointing that while there were a number of individual interested farmers present at the workshop, no farming representative bodies were represented. However, the Irish farmer research and advisory body, Teagasc, was present at the meeting and a representative was interviewed as part of the study. Members of the Tuft Cutters association were invited to the workshop but did not attend. It should be pointed out that both farming representative bodies and those interested in turf cutting were invited to be part of the Curlew Task Force and did participate to some degree. This demonstrates incremental changes in stakeholder engagement which were brought about by the workshop and the learning from the discussions. However, the reality is that other options will be needed to engage with these important stakeholders. At the local level, it is the development of personal relationships with landowners which is and will continue to be key and this aspect, according to one of the authors, who works at the National Parks and Wildlife Service, appears to be working well. Having the option of bypassing representatives and working directly with stakeholders such as

farmers may be particularly important in this stakeholder process.

While the approach we describe here is context dependent (as with many conservation issues), we argue that an important catalyst for this and other similar processes is the definition and recognition of a shared problem, in which a diversity of stakeholders from science, policy, and practice have a role to play (Young et al., 2014). Scientists have a key role in communicating research more effectively to the key stakeholders to inform them sooner and better on the extent of species decline. This includes the better use of framing their research, or using narratives that can increase the impact of their knowledge (Carmen, Watt, & Young, 2018; Howard et al., 2018; Rose, Brotherton, Owens, & Pryke, 2018). Importantly, scientists may need to go further by suggesting practical management options, including how to implement these options, their costs, and the trade-offs involved in not implementing them (Balian et al., 2016). Governments and their departments have a role in providing the resources for scientists to monitor population size and the will and resources to implement conservation actions. As the example in this article highlights, they also have a role in supporting initiatives that bring key stakeholders together to exchange knowledge and start the process of joint discussions and action setting. Finally, landowners and managers have a role in implementing the actions they have themselves identified. As highlighted in this paper, the workshop provided an initial opportunity for local stakeholders, including landowners, to have a say in the way in which they could manage their land for curlews. This follows other studies that have emphasized the need for such bottom-up early ownership of conservation actions (e.g., O'Rourke, 2005). Hopefully, the results of this study will allow the stakeholders involved to continue to jointly monitor progress of their proposed actions with conservation outcomes, while acknowledging and addressing the many barriers and drivers that continue to hamper curlew conservation.

To conclude, based on our experience in Ireland on the conservation of the curlew, we argue that the above, combined with a transparent approach to developing joint solutions and sufficient resources can encourage more stakeholders to become stakesharers in conservation. Our study also highlights the need for more studies to evaluate the long-term effectiveness of stakeholder processes in conservation. Despite some encouraging progress in terms of the short- and medium-term actions identified by stakeholders in this context, many stakeholders will measure the overall success of curlew conservation in Ireland by the long-term viability of the breeding population.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the organizers and participants of the "Curlew in Crisis" workshop 4 November, 2016. We would also like to thank the stakeholders who participated in the interviews and who give their time to help us understand some of the processes involved. Finally, we would like to thank three reviewers and the associate editor for their constructive comments on an earlier version of this manuscript.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS CONTRIBUTIONS

Juliette C. Young and Barry J. McMahon led the writing of the manuscript and compiled and analyzed the data from the workshop; Amy McCluskey gathered and analyzed the data from the interviews; all authors contributed critically to the drafts and gave final approval for publication.

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REFERENCES

Ainsworth, G. B., Redpath, S. M., Wernham, C. V., Wilson, M. W., & Young, J. C. (2020). Integrating scientific and local ecological knowledge to address conservation conflicts: Towards a practical framework based on lessons learned from a Scottish case study. *Environmental Science and Policy*, *107*, 46–55.

Balian, E. V., Druis, L., Eggermont, H., Livoreil, B., Vandewalle, M., Vandewoestjine, S., ... Young, J. (2016). Supporting evidence-based policy on biodiversity and ecosystem services: Recommendations for effective policy briefs. *Evidence & Policy*, *12*(3), 431–451.

Balmer, D. E., Gillings, S., Caffrey, B. J., Swann, R. L., Downie, I. S., & Fuller, R. J. (2013). *Bird atlas 2007–11: The breeding and wintering birds of Britain and Ireland*. Thetford: BTO Books.

Bennett, N. J., Roth, R., Klain, S. C., Chan, K. M., Clark, D. A., Cullman, G., ... Thomas, R. E. (2017). Mainstreaming the social sciences in conservation. *Conservation Biology*, *31*(1), 56–66.

Bracken, F., McMahon, B. J., & Whelan, J. (2008). Breeding bird populations of Irish peatlands. *Bird Study*, *55*, 169–178.

Carmen, E., Watt, A. D., & Young, J. C. (2018). Arguing for biodiversity in practice from the national to the local: A case study from the UK. *Biodiversity and Conservation*, *27*(7), 1599–1617.

Colhoun, K., & Cummins, S. (2013). Birds of conservation concern in Ireland 2014–2019. *Irish Birds Volume*, *9*, 523–544.

Colhoun, K., Mawhinney, K., & Peach, W. J. (2015). Population estimates and changes in abundance of breeding waders in Northern Ireland up to 2013. *Bird Study*, *62*(3), 394–403.

Curlew Media (2016). http://www.Curlewmedia.com/current-projects/.

Donaghy, A. (2014). Surveys for breeding curlew in the border counties 2011-2014: Halting environmental loss project. In *Kilcoole, co*. Wicklow: BirdWatch Ireland.

European Commission. (2007). *Natura 2000 Technical Report 003–2007: Management Plan for Curlew (Numenius arquata) 2007–2009*. Luxembourg: Office for Official Publications of the European Communities.

Franks, S. E., Douglas, D. J. T., Gillings, S., & Pearce-Higgins, J. W. (2017). Environmental correlates of breeding abundance and population change of Eurasian curlew *Numenius arquata* in Britain. *Bird Study*, *64*(3), 393–409. https://doi.org/10.1080/00063657.2017.1359233

Hadorn, G. H., Bradley, D., Pohl, C., Rist, S., & Wiesmann, U. (2006). Implications of transdisciplinarity for sustainability research. *Ecological Economics*, *60*(1), 119–128.

Henle, K., Alard, D., Clitherow, J., Cobb, P., Firbank, L., Kull, T., … Young, J. (2008). Identifying and managing the conflicts between agriculture and biodiversity conservation in Europe—A review. *Agriculture, Ecosystems & Environment*, *124*(1–2), 60–71.

Howard, B., Braat, L. C., Bugter, R. J. F., Carmen, E., Hails, R. S., Watt, A. D., & Young, J. C. (2018). Taking stock of the spectrum of arguments for biodiversity. *Biodiversity and Conservation*, *27*(7), 1561–1574.

Mace, G. M. (2014). Whose conservation? *Science*, *345*(6204), 1558–1560.

Malone, S., & O'Connell, C. (2009). *Ireland's Peatland conservation action plan 2020 – Halting the loss of peatland biodiversity*. Kildare: Irish Peatland Conservation Council.

Mascia, M. B., Brosius, J. P., Dobson, T. A., Forbes, B. C., Horowitz, L., McKean, M. A., & Turner, N. J. (2003). Conservation and the social sciences. *Conservation Biology*, *17*(3), 649–650.

Mishra, C., Young, J. C., Fiechter, M., Rutherford, B., & Redpath, S. M. (2017). Building partnerships with communities for biodiversity conservation: Lessons from Asian mountains. *Journal of Applied Ecology*, *54*, 1583–1591.

Muñoz-Erickson, T. A., Aguilar-González, B., Loeser, M. R., & Sisk, T. D. (2010). A framework to evaluate ecological and social outcomes of collaborative management: Lessons from implementation with a northern Arizona collaborative group. *Environmental Management*, *45*(1), 132–144.

O'Rourke, E. (2005). Socio-natural interaction and landscape dynamics in the Burren, Ireland. *Landscape and Urban Planning*, *70*(1–2), 69–83.

O'Donoghue, B. G., Donaghy, A., & Kelly, S. B. A. (2019). National survey of breeding Eurasian curlew *Numenius arquata* in the Republic of Ireland, 2015–2017. *Wader Study*, *126*(1), xxx–xxx.

Redpath, S., Linnell, J., Festa-Bianchet, M., Boitani, L., Bunnefeld, N., Dickman, A., … Milner-Gulland, E. J. (2017). Don't forget to look down—collaborative approaches to predator conservation. *Biological Reviews*, *92*(4), 2157–2163.

Redpath, S., Young, J., Evely, A., Adams, W. M., Sutherland, W. J., Whitehouse, A., … Watt, A. D. (2013). Understanding and managing conflicts in biodiversity conservation. *Trends in Ecology and Evolution*, *28*(2), 100–109.

Reed, M. S. (2008). Stakeholder participation for environmental management: A literature review. *Biological Conservation*, *141*(10), 2417–2431.

Reyers, B., Roux, D. J., Cowling, R. M., Ginsburg, A. E., Nel, J. L., & Farrell, P. O. (2010). Conservation planning as a transdisciplinary process. *Conservation Biology*, *24*(4), 957–965.

Rose, D. C., Brotherton, P. N., Owens, S., & Pryke, T. (2018). Honest advocacy for nature: Presenting a persuasive narrative for conservation. *Biodiversity and Conservation*, *27*(7), 1703–1723.

Sarkki, S., Tinch, R., Niemelä, J., Heink, U., Waylen, K., Timaeus, J., … van den Hove, S. (2015). Adding 'iterativity' to the credibility, relevance, legitimacy: A novel scheme to highlight dynamic aspects of science–policy interfaces. *Environmental Science and Policy*, *54*, 505–512.

Torkar, G., & McGregor, S. L. (2012). Reframing the conception of nature conservation management by transdisciplinary methodology: From stakeholders to stakesharers. *Journal for Nature Conservation*, *20*(2), 65–71.

Watt, A. D., Ainsworth, G., Balian, E., Cojocaru, G., Darbi, M., Dicks, L., … Young, J. C. (2019). EKLIPSE: Engaging knowledge holders and networks for evidence-informed European policy on biodiversity and ecosystem services. *Evidence and Policy*, *15*(2), 253–264.

Wondolleck, J. M., & Yaffee, S. L. (2000). *Making collaboration work: Lessons from innovation in natural resource managment*. Washington, DC: Island Press.

Young, J., & Marzano, M. (2010). Embodied interdisciplinarity: What is the role of polymaths in environmental research? *Environmental Conservation*, *37*(4), 373–375.

Young, J. C., Rose, D. C., Mumby, H., Benitez-Capistros, F., Derrick, C. J., Finch, T., … Mukherjee, N. (2018). A methodological guide to using interviews in conservation science research. *Methods in Ecology and Evolution*, *9*(1), 10–19.

Young, J. C., Thompson, D., Moore, P., MacGugan, A., Watt, A. D., & Redpath, S. M. (2016). A conflict management tool for conservation agencies. *Journal of Applied Ecology*, *53*(3), 705–711.

Young, J. C., Waylen, K., Sarkki, S., Albon, S., Bainbridge, I., Balian, E., … Watt, A. (2014). Improving science-policy dialogue to meet the challenges of biodiversity conservation: Having conversations rather than talking at one-another. *Biodiversity and Conservation*, *23*(2), 387–404.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

How to cite this article: Young JC, McCluskey A, Kelly SBA, et al. A transdisciplinary approach to a conservation crisis: A case study of the Eurasian curlew (*Numenius arquata*) in Ireland. *Conservation Science and Practice*. 2020;2: e206. https://doi.org/10.1111/csp2.206