

## RESEARCH ARTICLE



# 'Do you care about the river?' A critical discourse analysis and lessons for management of social conflict over Atlantic salmon (*Salmo salar*) conservation in the case of voluntary stocking in Wales

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## Abstract

1. Stakeholders with shared interests in fish conservation often disagree about which specific conservation measures are appropriate, leading to conflicts with sometimes long-lasting and disruptive social and political effects. Managers are challenged to balance opposing stakeholder preferences with their own mandates in a charged environment. Using the 2014 termination of Atlantic salmon (*Salmo salar*) stocking in Wales as a case, we conducted a critical discourse analysis of interview data, online print media, social media and policy documents to examine conflict and its mechanisms over time. The data sources represented four discourse planes: the social, media, social media and policy planes. We report five key findings:
2. The conflict around salmon stocking took place in three stages, beginning with a negotiated, manifest conflict that escalated during the 2014 policy process that terminated stocking, creating a persistent spin-off conflict.
3. The stocking debate was shaped by two discourse coalitions promoting either pro- or anti-hatchery arguments, and an emerging third coalition advocating for compromise. The coalitions disagreed on the effectiveness of stocking, the status of the salmon stock and had different management goals, revealing that the pro- or anti-stocking debate was caused by complex, intertwined and partly opposing beliefs and values.
4. Different elements of the discourses emerged on different planes and arguments were mobile across the planes over time, explaining how selected key arguments were able to persist, gain dominance, re-appear over time, thus dynamically fueling and (re)shaping the conflict.
5. The policy change decision to terminate stocking in Wales institutionalized anti-stocking discourses. It forced all stakeholder groups to acquiesce to one perspective of stocking, creating a win-lose situation for some stakeholders.

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6. The handling and result of the policy change led to the alienation of some stakeholder groups. Ecological management goals were achieved in the short term, but the acrimonious and yet-unsettled social side effects affected the long-term relationships and may negatively impact future conservation issues in the area.
7. We conclude that transdisciplinary active management designed for joint learning about stocking trade-offs may be a suitable alternative to the 'either-or' outcomes observed in Wales that fostered sustained stakeholder conflicts instead of joint production of knowledge and understanding.

#### KEYWORDS

Atlantic salmon, conflict, discourse analysis, fisheries management, governance, hatcheries, recreational fisheries, River Wye, *Salmo salar*, stocking

## 1 | INTRODUCTION

Fish stocking has historically been a popular management measure, with the intention of enhancing fishing opportunities, compensating for degraded environments, replacing missing or dysfunctional spawning sites, and supporting threatened or declining populations (Arlinghaus, Tillner, & Bork, 2015; Berg, 1986; Cowx, 1994; Hilborn & Eggers, 2000; Lorenzen et al., 2013). In many species supported by stocking, wild-captured fish are artificially bred and offspring are reared in hatcheries for part of their life cycle before being released into the wild to supplement wild production. For example, Atlantic salmon (*Salmo salar*), a culturally and economically important migratory fish species in North Atlantic regions (Aas et al., 2018; Ignatius & Haapasaari, 2018), has been stocked for well over a century to support dwindling wild populations in North America and European countries (Berg, 1986; Parrish, Behnke, Gephart, McCormick, & Reeves, 1998). Beyond the ecological reasons for stocking, the practice can also enhance the benefits that fishers derive from the exploitative use of the aquatic environment (Holmlund & Hammer, 1999; Ignatius & Haapasaari, 2018; van Poorten, Arlinghaus, Daedlow, & Haertel-Borer, 2011). The same is true for voluntary work in hatcheries, which provides multiple psychological and social benefits to those engaged in the practice of raising and releasing salmon through stocking (Harrison, Kochalski, Arlinghaus, & Aas, 2018).

Progress in the scientific understanding of stocking-based population dynamics and genetic mixing of stocked and wild fish has raised concerns over the potential negative impacts of stocking on wild fish populations (Lorenzen, Beveridge, & Mangel, 2012). The main concern is that hatchery fish, particularly when released in large numbers into threatened wild populations, can outcompete or outnumber their wild conspecifics (Blanchet, Páez, Bernatchez, & Dodson, 2008; Jonsson & Jonsson, 2006; Swain & Riddell, 1990) and through cross-breeding affect the genetic integrity of wild subpopulations through a process called genetic swamping (Garcia de Leaniz et al., 2007; Laikre, Schwartz, Waples, & Ryman, 2010). Such effects could narrow the genetic diversity within wild populations or lead

to loss of adapted gene complexes (Araki & Schmid, 2010; Garcia de Leaniz et al., 2007; Naish et al., 2007) and may create fish that are poorly adapted to the natural environment over the long term (Araki, Cooper, & Blouin, 2007; Henderson & Letcher, 2003). Clearly, stocking can enhance fish catch (Amoroso, Tillotson, & Hilborn, 2017), but the issue of genetic and evolutionary impacts and spread of diseases from the supplemented stock to conspecifics or other species (e.g. *gyrodactylus*) continues to create concerns and cause for debate (Lorenzen et al., 2012).

The evidence that stocking can have adverse effects on wild populations and genetic biodiversity has led to recent changes in stocking guidelines and practices for Atlantic salmon to varying degrees in different countries (Aas et al., 2018), and increased emphasis on habitat restoration to rebuild declining stocks (North Atlantic Salmon Conservation Organisation, 2017; Norwegian Environment Agency, 2014). Concerns about hatchery practices have also been raised towards voluntary initiatives by local angling clubs and river owner associations (Harrison, Kochalski, et al., 2018; Harrison, Rybråten, & Aas, 2018), which coexist in Europe with larger state-driven initiatives but are not mandated by law and are often run informally (Aas et al., 2018; Berg, 1986).

The interplay between socioeconomic and ecological risk and benefits makes stocking a contentious issue (Hunt & Jones, 2018), particularly because some research has pointed towards stocking as an effective measure depending on stocking objectives and circumstances (Amoroso et al., 2017; Arlinghaus, 2006; Arlinghaus, Lorenzen, Johnson, Cooke, & Cowx, 2016; Camp, Lorenzen, Ahrens, & Allen, 2014; Johnston et al., 2018; Lorenzen, 2014; Lorenzen et al., 2013). Therefore, stakeholders vary in their perspective about the pros and cons of stocking. Our goal was to take a human dimensions perspective in understanding stocking-related conflicts based on a case study on ending the stocking of Atlantic salmon in Wales in 2014. Despite a policy review, consideration of the relevant scientific literature, and a public consultation process, the policy shift and the process by which it was carried out has drawn considerable criticism from salmon hatchery supporters, and the conflict between pro- and anti-hatchery factions continued even after the countrywide

termination of the stocking programs (Harrison, Kochalski, et al., 2018). Our motivation in this study was to understand why.

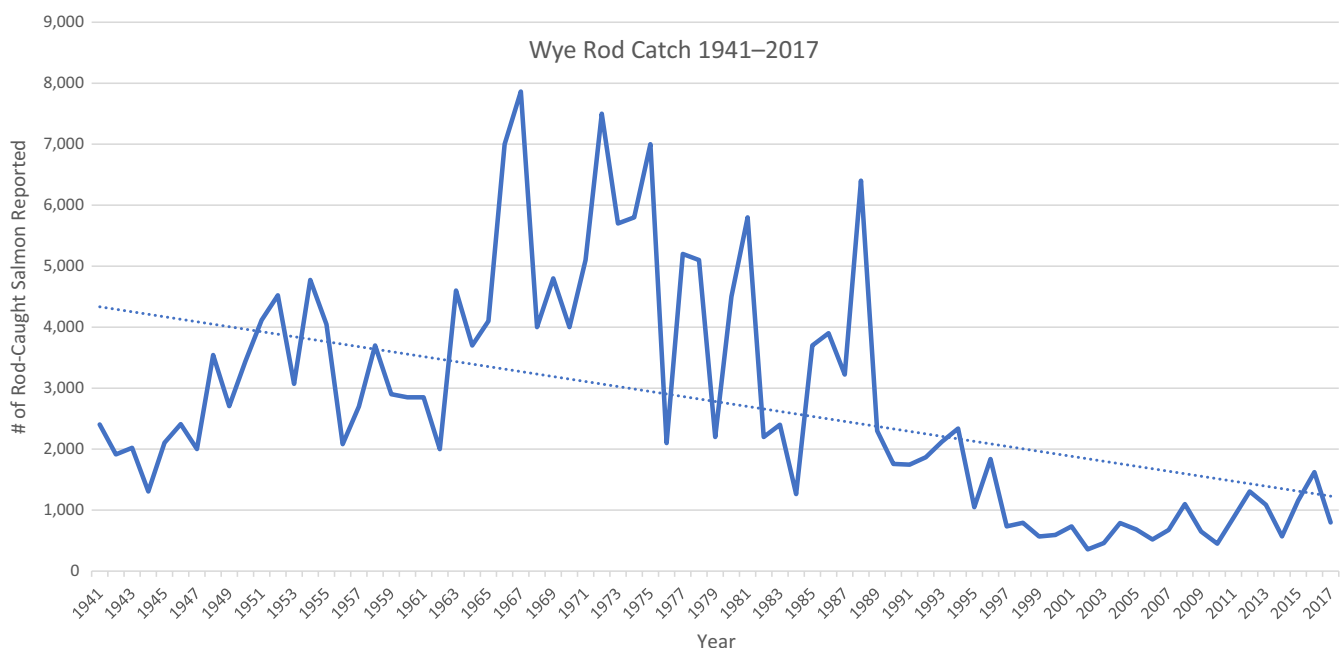
Given that conflicts in fisheries often persist and develop over years, we posit that it is not only necessary to look at structural and material causes for conflict (Arlinghaus, 2005; Charles, 1992; Harrison & Loring, 2014; Pomeroy et al., 2007; Redpath et al., 2013), but to view conflicts as processes and take into consideration their evolution over time (Bennett et al., 2001; Harrison & Loring, 2014). The aims of this study were to describe the stocking debate before, during and after the consultation process and to analyse the conflict mechanisms. We used critical discourse analysis (CDA; Fairclough & Wodak, 1997) because it views discourse as the linguistic manifestation of social reality, thus giving us the ability to access social processes through spoken words and written text. In using this approach, we extended the example of others (Butteriss, Wolfenden, & Goodridge, 2001; Whittaker & Mercer, 2004) by looking at discourse within several different societal arenas, called discourse planes: the societal, media, social media and policy planes. By describing and analyzing a real-world example of the stocking debate, this study addresses the broader social underpinnings of the stocking debate and to draw conclusions for the sustainable management of wild fish populations that considers social and ecological outcomes in more detail.

## 1.1 | Case background: Salmon stocking on the River Wye

The River Wye salmon fisheries have been important to the region since the mediaeval period (Hurley, 2008). Fishing rights belong to owners of property adjacent to or including the river, an ownership scheme common to European riverine fisheries (Arlinghaus, 2006; Daedlow, Beard, & Arlinghaus, 2011; Stensland, 2010).

In response to anthropogenic events on the Wye, efforts to improve and conserve salmon runs in the Wye have been undertaken throughout the 19th, 20th and 21st centuries. Because of logistical and environmental challenges to in-river stock monitoring, current stock assessments on the Wye are made from egg-deposition modelling and rod catch surveys (M. Guys, pers. comm., September 10, 2018; Natural Resources Wales, 2015). These surveys show trends in Wye salmon stocks similar to trends in wild Atlantic salmon populations in other European countries: a relative abundance of salmon from the mid-1960s until the late 1980s, followed by a sharp decline in the early 1990s that precipitated into the comparably low abundance found today (Figure 1). Current fishing regulations on the River Wye limit salmon angling to catch-and-release only, and fishing licences are purchased through private river owners, angling clubs or other local organizations who lease fishing permissions.

Hatcheries and salmon stocking were introduced on the River Wye in the early 20th century in response to damming of the Elan Valley, which was carried out to improve the water supply to nearby metropolitan areas (Mansergh, 1901). Since then, a series of hatcheries and stocking projects operated by both the state as well as conservation organizations have been used to stock the River Wye with juvenile salmon. The most recent incarnation of stocking efforts began in 2011 with the introduction of a semi-natural rearing (SNR) pond initiative, a project that was largely privately funded and supported through a collaborative effort between several stakeholder groups. The SNR ponds were intended to rear a more wild-type salmon with potentially improved behavioural and physiological adaptations to survival in the Wye. The SNR pond project recapture study was intended to run for 10 years, where all rod-caught salmon from the River Wye and its tributaries were to be inspected for an indicative clipped adipose fin.



**FIGURE 1** Wye Rod Catch from 1941 to 2017 with trend line, showing an overall decrease in number of reported rod-caught salmon

The River Wye is a transnational river that makes up part of the border between eastern Wales and southwestern England. Prior to 2013, the river and its fisheries were jointly managed by the Environmental Agency Wales (EAW) and the Environmental Agency England (EA). However, in 2013 EAW was merged with the Countryside Council for Wales and the Forestry Commission Wales into the consolidated and broader-reaching agency Natural Resources Wales (NRW) (*Asiantaeth yr Amgylchedd Cymru*). The resulting managerial structure separated the duties of NRW and EAE along their respective side of the border.

In Wales, NRW is responsible for a broad remit of governance. Specifically with regard to their management of salmon fisheries, NRW commits 'to protect, through best-practice scientific management and the ecosystem approach, the sustainability and productivity of wild salmon and sea trout stocks in Wales' (Gough, 2017). In this, NRW defines an ecosystem approach as an 'approach in which populations of fish are managed in a holistic way as a component of the environment, and not solely for the support of recreational or commercial fisheries' (Natural Resources Wales, 2014a, p. 9) NRW salmon managers also balance other competing regulatory obligations such as overarching frameworks such as the European Union's Habitats and Water Directives (92/43/EEC, 1992; 2000/60/EC, 2000) and the Salmon and Freshwater Fisheries Act 1975, as well as considerations such as encouraging the sale of fishing licences that fund resource management initiatives.

The 2013 agency restructuring prompted a re-evaluation of many projects and their compliance with multiple requirements of the former agencies. The review resulted in a proposed policy to terminate all stocking projects in Wales, inclusive of third-party commercial hatchery and stocking operations. After a contested public consultation process, the eventual decision was to terminate all stocking in Wales in 2014 (except for some research-based projects). In 2015, the last remaining SNR pond-reared salmon were released into the Wye.

## 2 | MATERIALS AND METHODS

### 2.1 | Theoretical approach

We applied CDA (Fairclough & Wodak, 1997) by identifying language, themes and events that together composed discourses about the policy decision to terminate stocking. A CDA is not interested in the linguistic elements of the source texts, but rather in what elements are recurring within the text and how power, society and culture are shaped by and shaping the discourse (Fairclough & Wodak, 1997). By analyzing the component strands of those discourses, the main drivers of conflict and power relations between the discourse coalitions were revealed (Fairclough, 2001; Jäger & Maier, 2009).

We followed the steps to discourse analysis proposed by Fairclough (2001): compilation of the data corpus, transcription of recorded information (where applicable), and selection of relevant text section that were related to conflicts over hatcheries and stocking. For each text sample, we analysed the text (themes, structures,

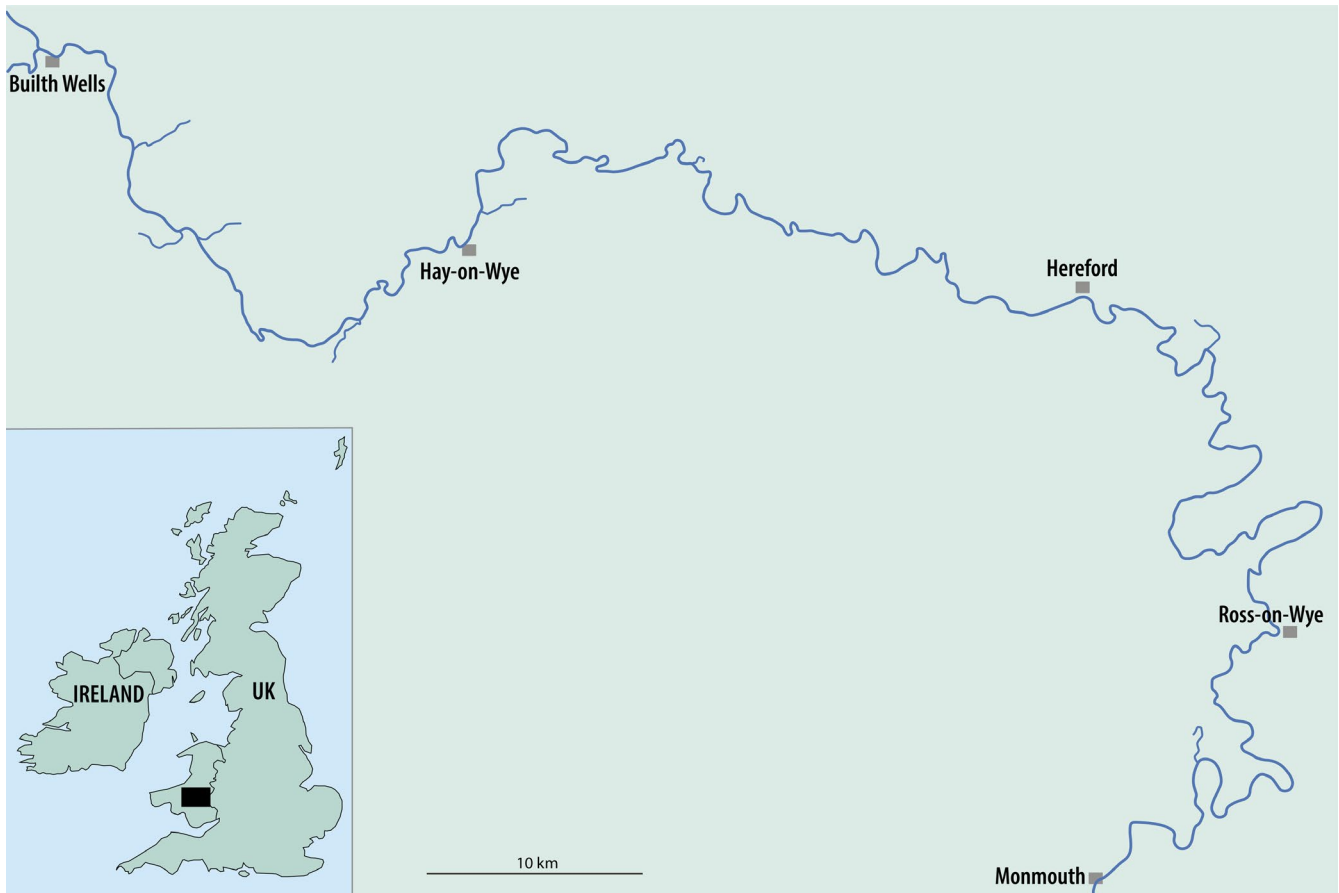
patterns, language, events), the immediate textual context (e.g. how are people interpreting the situation? How does the text relate to the other discourse fragments in the text?), and the relationship to the context and the overall discourse (e.g. do people agree or disagree? What contextual factors influence this discourse? Does the discourse contribute to a social power struggle?). For the concrete work with the text, we followed the coding and categorization procedures developed for and applied in grounded theory such as open coding, development of concepts and then categorization of concepts to form theories (Corbin & Strauss, 1990; Strauss & Corbin, 1990).

### 2.2 | Data collection

The analysis was based on the discourses in four planes identified a-priori: the social (interview data), media (news articles in online regional media), social media (postings in forums and social media platforms) and policy planes (documents relating to NRW's hatchery consultation in 2014). Discourse planes are societal locations where discourses about a specific topic are taking place (Jäger & Maier, 2009). Different discourse planes 'influence each other and relate to each other' (Jäger & Maier, 2009, p. 48) so studying them conjointly offers a better opportunity to represent social complexity and understand complex social processes than studying a single discourse plane.

For the social plane, in-depth, semi-structured interviews and site visits were conducted with 26 individuals in locations selected by interview participants during 2 weeks in June 2016. Participants were identified using the key informant method (Marshall, 1996) as well as through purposive sampling to equally include all relevant stakeholder groups (representatives of angling clubs and conservation organizations, river owners, retired and current salmon fishery managers, biologists and salmon cultivators, individual anglers, and ghillies). Researchers travelled to meet interview participants throughout the Wye catchment area between the Builth Wells and Monmouth areas (Figure 2). Researchers also engaged in participatory observation activities, allowing them to gain insights about the River Wye salmonscape, salmon rearing practices, and the social and personal experiences of interview participants. Interviews were conducted with individuals and small groups, typically lasted between 60 and 180 min, and were recorded with the approval of the participant and later transcribed. The interviews were semi-structured with open-ended questions, and interview participants were encouraged to share relevant information and stories (Corbin & Morse, 2003; Witzel & Reiter, 2012).

The analysis of the media plane was based on 23 online newspaper articles from outlets such as the BBC (N = 9) and The Guardian (N = 1), the Hereford Times (N = 2), the Independent (N = 3), and a selection of smaller news outlets (N = 8) spanning the time period from 1995 to 2017 (see Data Sources). Articles were selected based on keyword searches (i.e. River Wye salmon, salmon stocking, stocking, Wye salmon fisheries, etc.) using internet search engines and searches on news websites who matched keyword searches.



**FIGURE 2** Map of the study area. River Wye and catchment area between Builth Wells and Monmouth

For analyzing the policy plane, all official responses ( $N = 26$ , representing 112 individuals) to the 2014 public consultation regarding the change of policy to close stocking and hatchery projects in Wales were collected and analysed, as well as documents and reports produced by NRW and other government agencies as related to the policy change (e.g. evidence assessment, consultation response summary).

For the social media plane, comments and postings from online forums and from Facebook pages of stakeholder groups and clubs were collected and analysed in the same manner as the media plane. Facebook was used as the data source from traditional social media because stakeholder groups generally did not have social media accounts on other platforms (e.g. Twitter, Instagram), or because other social media platforms had not been used for informal online discussions over the time line of interest to this study in the same manner as Facebook.

### 2.3 | Data analysis

Each document was first read in its entirety and evaluated for recurring arguments, events and discourses as well as the context in which they took place. Coding of these findings was done using qualitative data analysis software packages Atlas.Ti (Paulus & Lester, 2016) and NVivo (NVivo qualitative data analysis Software, 2012).

Codes were organized around themes (e.g. evidence, policy making, points of conflict, etc.) and related or similar concepts were grouped together to form categories, identify patterns and linkages, and develop theories (Strauss & Corbin, 1990).

Coding was primarily conducted by the first author. To evaluate the robustness of the analysis, the second author coded parts of the text corpus from the social, policy and media plane separately. Comparing the emerging codes and themes between the coders revealed a high degree of qualitative agreement between the two coders. All codes and themes were discussed between the coders and other authors to further corroborate the validity of the coder's findings.

The process of coding, grouping and categorizing made it possible to identify and disentangle discrete discourse strands that were attributed to opposite points of view (i.e. pro or anti-hatchery). Based on these opposing lines of argument, the social groups or individuals repeating and promoting them were categorized inductively into discourse coalitions. Members of a discourse coalition share particular terms, concepts and ways of thinking representing social and physical processes, but the members of a discourse coalition do not necessarily need to have formal relationships, and discourse coalitions are not necessarily forms of conscious coalitions to promote specific agendas (Hajer, 1995).

Finally, we re-constructed the narrative of each discourse coalition by examining how those discourses were produced in, supported

by, changed within, or were intermittently present or absent across the discourse planes. We identified primary discourse strands within each plane and discourses that occurred together and focused on a common topic (Jäger & Maier, 2009). We verified each discourse strand by comparing each of them against the same discussions taking place in other discourse planes. Through this process, we were able to identify whether discourses were specific to one plane or shared across the case and which discourses were consistently produced in the different planes by which discourse coalition.

### 3 | RESULTS

#### 3.1 | Part I: the stocking debate prior to termination of stocking

Discussions about salmon and stocking of salmon in the River Wye were shaped by two major discourse coalitions that we call the Recovery and the Decline Coalition. These coalitions were discernable across all discourse planes and were characterized by charismatic leaders within each discourse coalition who, to varying degrees, influenced the evolution of their coalition's discourses. Longstanding personal conflicts between these leaders emerged strongly within discourses from both coalitions.

The Recovery Coalition portrayed the River Wye salmon stocks as in a state of incremental recovery, which was credited primarily to habitat and water quality improvement. The group included a breadth of attitudes about hatcheries and salmon stocking, ranging from rigidly 'anti-hatchery' to questioning the cost-benefit balance of funding hatchery work. The decision to end all stocking activities in Wales in 2014 was generally supported. Members of this coalition included some fisheries managers, members of Wye angling groups and individual anglers, and leaders of environmental NGOs who work within the Wye watershed but are not necessarily focused on salmon issues.

The Decline Coalition took positions explicitly in response to claims of the Recovery Coalition. They portrayed the River Wye salmon stocks as in a state of continuous decline or as failing to fully recover and were generally dissatisfied with the decision to end all stocking in 2014. This coalition was comprised of individuals and groups primarily made up of private and club anglers, river owners, some fisheries managers, and some NGO salmon groups.

Specific to stocking, the debate between the Recovery and Decline Coalition revolved around ecological benefits, risks and cost-effectiveness, a discourse strand raised primarily in interviews (social plane) but echoed in the media and policy planes. With regard to the benefits of stocking, the members of the Recovery coalition stated in the interviews that they believed that hatchery projects had not and, if not for the ban, would not offer any improvement to Wye salmon stocks. They credited any increase in the stock levels to barrier removal, habitat improvement, and bringing agriculture and forestry industries within the Wye's catchment into better compliance with river and water quality protection guidelines. Consequently, the conservation group member leading the salmon habitat restoration

and improvement efforts was credited as the 'savior' of the river (A. Bishop, June 13, 2016). While habitat remediation was described as 'treating the disease' of salmon stock decline, stocking was seen as only addressing the 'symptoms' (S. Miles, June 20, 2016).

The interviewed Decline Coalition members unanimously agreed that the ecological recovery of the Wye was essential to salmon stocks but believed that guidelines and regulations were interpreted in such a way that conservation work outside of habitat restoration was precluded. They argued that 'habitat improvements are only one tool in the box' (Consultation response #11, p. 3) and that stocking was a necessary addendum. As one fisheries manager exemplified:

What I find quite interesting is that quite often, people think it's either-or. You've got to do all the habitat, or you just got to forget the habitat and put loads of hatchery fish in. For me, it's never been that—why should the two be mutually exclusive?

(H. Smith, June 15, 2016)

Specifically, the Decline Coalition credited hatcheries as preventing stock collapse during years of low abundance and pointed toward a lack of evidence indicating that habitat improvement was the sole effective effort on the river. They believed that the decision to end stocking had worsened future outcomes for Wye salmon, particularly in the event of an environmental catastrophe. That years of stocking had not achieved a full recovery of the salmon stock levels was attributed by the Decline Coalition to imperfect technologies, insufficient funding of research and monitoring of hatchery results, and politicized management rather than stocking as a principally faulty approach to conservation.

The debate about the effectiveness of stocking was enabled by a lack of precise monitoring of Wye salmon stocks. All coalitions were highly interested in obtaining accurate population data, as well as information about the return rate of stocked fish. The semi-natural rearing ponds initiated in 2011 were of strong interest for the Decline Coalition as a means of performing a recapture study to assess return rates of stocked salmon, as well as implementing more wild-type conditions to improve behavioural and conservational outcomes of stocked fish.

For the members of the Recovery Coalition, fish reared semi-naturally were still perceived to be inferior to wild stocks and the recapture study was a way to consolidate their arguments against stocking. For them, the project would have either shown that the hatchery produced fish that return as adults for spawning, meaning then that stocking had the potential to damage the genetic integrity of wild stocks; or it would have confirmed that stocking did not 'work', meaning hatcheries were a waste of energy and financial resources.

According to the analysis of the media plane, this outright rejection of stocking was a result of a creeping polarization of the stocking debate. From 1996 until as late as 2010–2011, stocking and habitat improvement were portrayed in the media as complementary measures towards restoring Wye salmon stocks ('Thousands of salmon



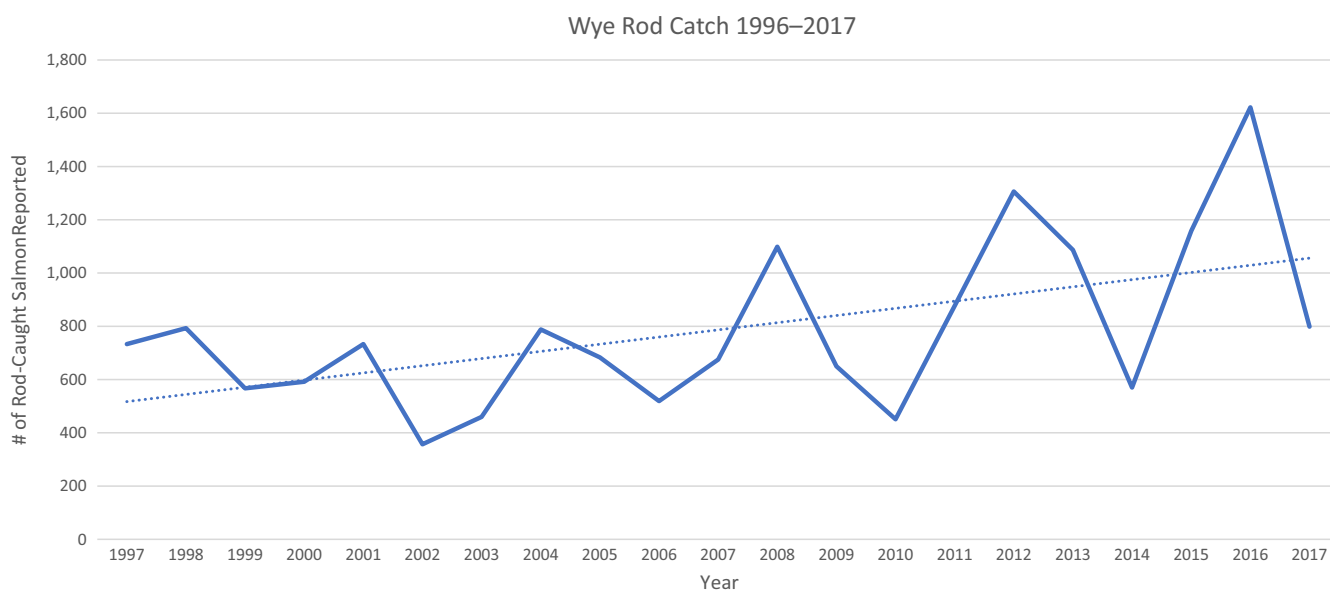
released into Severn', The Forest Review, October 20, 2010, Data Sources). However, the voices represented in the media changed in the early 2000s with the efforts of the conservation group conducting habitat restoration work on the Wye being gradually more recognized.

Becoming more dominant in the media discourse was linked to the conservation group's ability to obtain grants for their work. Finances were treated by both discourse coalitions as a zero-sum game where increased funding for one measure takes away resources from another one. When weighing up stocking and habitat improvement, the Recovery Coalition argued that habitat initiatives, while expensive, were a 'capital investment' (S. Miles, June 21, 2016) that could attract significant matching funds from external institutions (i.e. the EU) and thus eventually be self-sustaining. Hatcheries, they argued, required ongoing annual infusions of capital with comparably little return on investment. The Decline Coalition responded by pointing out that some hatchery initiatives were privately funded, arguing for the economic autonomy of individuals and private organizations in choosing to fund stocking programs. For example:

Enhancement stocking on all Welsh rivers (not being supplied by EA/NRW) is funded by Anglers, Angling Clubs, Associations and Federations who feel the need to at least try and maintain their river runs of Salmon and Sea Trout, as EA/NRW's remit "to maintain and improve" has failed so badly. [sic throughout]  
(Consultation response #12)

While not explicitly stated by the coalition members, our analysis suggests that the disagreement about stocking was deeply rooted in people's perceptions of the status of the salmon stocks and their goals for the future of the River Wye. This becomes most clear when considering the history of the River Wye. The Recovery Coalition considered 2016 stock levels to be indicative of a 'successful' (if slow) recovery of Wye salmon stocks, referencing the positive trend in rod catches from the 1990s onward (Figure 3). In contrast, the Decline Coalition, which included many of the oldest anglers (age 65–75) interviewed for this study, refuted the Recovery Coalition's assessment of Wye salmon recovery, as many coalition members remembered stock levels from the 1970s when stocks and catch rates were booming (Figure 1). Taking this long view, stock levels in 2016 were only an improvement in comparison to 2002 levels when total Wye rod catches were at historic lows. Some members of the Decline Coalition recognized these different temporal scales and expressed concern that the younger generation would accept the present stock levels as 'the new normal', indicative of shifting ecological baselines (Pauly, 1995).

With regard to the future, the two coalitions followed different conservation objectives. The Recovery Coalition sought to return the river to a more 'natural' state and viewed stocking as humans interfering with natural processes, whereas the Decline Coalition maintained that the River Wye catchment was a peopled landscape in which naturalness included some degree of human activity, and contested the notion that a policy change toward 'naturalness' would overcome many centuries of human influence. These different lines of argumentation sparked a 'what comes first' debate: should habitat be improved and then seeded with stocked fish (if necessary)? Or



**FIGURE 3** Wye Rod Catch from 1996 to 2017 with trend line, showing a graduate increase in overall reported rod-caught salmon. *Data Sources for Figures 1 and 3:* 1941 to 1965 Wye River Board, Fisheries Dept, Annual reports. 1966 to 1973 Wye River Authority, Fisheries Dept, Annual Reports. 1974 to 1976 Welsh National Water Development Authority, Wye Rivers Division, Fisheries Dept, Annual Reports. 1977 to 1983 Welsh Water Authority, Wye Division, Fisheries Dept, Annual Reports. 1984 to 1988 Welsh Water, Wye Area Fisheries & Conservation Dept, Annual Reports. 1989 to 1993 National Rivers Authority, Welsh Region, Wye District Annual Reports. 1996 to 2012 Environment Agency, Welsh Region, Area Annual Reports. 2013 to 2017 Natural Resources Wales, Annual Salmonid and Freshwater Fisheries Statistics

should stocking continue until the habitat supported a sustainable population? As one consultation response asserted:

With the levels of salmon so low in many of our Welsh rivers it would be madness to remove this option [stocking]. Only once rivers reach a certain [stock] level can stocking be safely stopped.

(Consultation #8)

The Recovery Coalition was also willing to accept a lower, if naturally produced, level of salmon stocks. Members of the Decline Coalition also supported a natural recovery, but viewed stocking as a potential means of achieving larger stocks at a faster rate. Larger stock levels were seen as desirable to accommodate social, recreational and economic objectives (e.g. continued engagement of anglers with the salmon resource), and faster conservation success (i.e. larger stocks) via stocking was especially valued by interviewees of advanced age who would be unlikely to live long enough to see a full stock recovery achieved by habitat improvement alone.

### 3.2 | Part II: the public consultation process

The public consultation process occurred from March to May 2014 during which NRW solicited comments from the public about the proposed policy change to terminate all stocking programs in Wales. This consultation process was not mandatory by law, but as a NRW official explained:

We wanted to talk to people. We wanted to hear views, we wanted to explain what we were doing and why we were doing it and what it would mean and what we were going to do instead. We wanted to do all of these things, and the most obvious mechanism was through this consultation process.

(P. Simmons, June 17, 2016)

Within the policy plane's consultation responses, discourses were similar to those from interviews and media articles, focusing on the social, economic, and ecological costs and benefits of stocking programs on the Wye, and the scientific debate about whether hatcheries improve wild salmon stocks or cause damage. However, new discourses emerged from the consultation responses: the issue of evidence and NRW's interpretation of evidence, issues of fairness concerning how policy consultation responses were solicited, and how these issues might affect the mutual trust and future collaboration between groups.

The issue of evidence, and what information should constitute evidence about the effects of stocking, was discussed frequently in the policy plane. Evidence from other rivers outside Wales was considered simultaneously appropriate and inappropriate, depending on whether it was being used to support or refute the writer's argument. While the Recovery Coalition drew on scientific studies and international salmon management guidelines (i.e. from the

North Atlantic Salmon Conservation Organization) to support the 2014 hatchery closures, the Decline Coalition referenced scientific arguments as well as social and psychological arguments for salmon hatcheries.

NRW's summary and analysis of the consultation responses (Natural Resources Wales, 2014b) stated that 'there has been no new evidence brought to our attention that might amend the conclusions set out in our initial review' (NRM & Salmon Stocking Report, p. 3), though our analysis found that many consultation responses from the Decline Coalition cited a number of authors, policies, and studies that they believed to support their case. Nonetheless, NRW did not consider that evidence sufficiently compelling to warrant further consideration.

This disagreement about information validity created mistrust for NRW's ability to manage Wye salmon stocks. In explicit and implicit statements, stakeholders questioned NRW's prioritization of conservation initiatives to benefit salmon, and ability to fairly evaluate evidence from all stakeholder groups and interests. Several anglers referred back to this issue in the interviews, saying:

There's about a half a dozen of us that felt sort of, angry I suppose, in the way that the decision had been taken and we felt that the decision to shut the hatcheries had been made and then they had to come out with the evidence as to why they made the decision and the evidence they produced was very, very weak. Extremely weak... We sort of felt we'd been steam rolled really.

(T. Clemmons, June 18, 2016)

The suspicions within the Decline Coalition that the policy decision to close hatcheries was made prior to the consultation process was fueled by the design of the consultation call itself which was perceived as biased. The consultation questionnaire was written so that an inherent dichotomy between habitat improvement and stocking was established. For example:

Q5. Do you agree or disagree that it would be more cost effective for NRW to improve habitats and thereby secure further reductions in mortality of wild fish as an alternative form of mitigation to stocking? ("A consultation on NRW's salmon stocking, third party salmon stocking and the future of NRW's hatcheries", NRW)

Multiple responses to the consultation from both coalitions criticized this framing of the issue, suggesting that options inclusive of both outcomes are possible. For example:

We do not believe that habitat improvement and mitigation stocking are mutually exclusive. We do believe they can, and should, operate alongside each other until such time as there is substantial evidence to do otherwise.

(Public consultation response #13, NRW)



Though in interviews NRW officials rejected the accusations that the call was biased, and that the decision was already taken beforehand, the notion of such biases alone undermined the integrity of the consultation and diminished stakeholders' willingness to collaborate with the authorities in the future:

The Environment Agency [NRW] was well on its way to establish a meaningful "working relationship" with many of its stakeholders including many of the angling fraternity, this proposal will potentially put that hard-won progress back considerably.

(Public consultation response #21, NRW)

This challenge was acknowledged by the managers:

I think we've learned – we always learn. The consultation exercise itself, the mechanics of it, could have been better. We are hoping that we've learned from that and are making a better job of talking to, listening to, and explaining issues which will affect future decisions. So, it's important we learn from this." [sic throughout]

(P. Gibson, June 16, 2016)

Managers pointed out that they were also bound in their decisions by higher principles such as the Precautionary Principle (see Arlinghaus, Cooke, Johnson, & Anrooy, 2012), which grants:

Authorities to take preventive action when there is a risk of severe and irreversible damage to human beings; action is required even in the absence of certainty about the damage and without having to wait for full scientific proof of the cause-effect relationship; when there is disagreement on the need to take action, the burden of providing the proof is reversed and placed on those who contend that the activity has or will have no impact.

(United Nations, 2002)

### 3.3 | Part III: the aftermath

In part III, we look at the aftermath of the policy decision. As the fieldwork took place in 2016, we examined how the binary decision to end stocking shaped subsequent discourses and evaluated whether this policy change exacerbated or relieved the intensity of the hatchery debate. Here, the social plane was important for providing impressions of past events and an assessment of the current situation. The media and social media planes supported, challenged, or expanded these results from the social plane by providing additional information.

The decision to close all non-research stocking in Wales was as a binary choice: leave hatcheries open or close them. Discontent over the consultation added a second level of conflict on top of the original conflict. People who did not achieve their preferred outcomes were discontent, but they were also dissatisfied by the

process itself, for example, that some evidence was not taken into consideration. This mismatch of expectations between what NRW was required to consider and how those who submitted consultation responses believed their input would be considered, a common theme within the social plane, illuminates why this conflict persisted during our fieldwork in 2016 when stocking had already been closed for 2 years.

The 2014 stocking closure also prematurely ended the semi-natural rearing ponds project, another point of frustration arising in the social and policy planes from Decline Coalition members who believed that the findings from the project could have provided more conclusive information toward ending the Wye stocking debate, and felt their investments in the SNR pond projects were wasted. Without ongoing stocking, it became impossible to meaningfully evaluate the effectiveness of stocking and demonstrate one way or another the actual impacts of stocking on the Wye.

In this situation, social media filled this gap by allowing a somewhat subversive space to express critical opinions to the decision. This is perhaps an indicator that those who felt unheard in mainstream media discourses turned to cyberspace and social media platforms. Unlike in other planes where Recovery Coalition discourses were becoming dominant, the social media plane was dominated by Decline Coalition discourses.

This re-emergence of evolved discourses often surprised those who were not privy to their evolution in social media, and sometimes re-ignited old conflicts. For example, a fishing syndicate's Facebook page reaction after a 2017 pollution event reflected that grievances about the prohibition on stocking were still present:

Is it a coincidence this is happening now [that] it is illegal to operate salmon/trout hatcheries in Wales. Is it fate or is it just destiny that the easiest way to kill off salmon is to let the farmers do [pollution] while we are impotent to do anything about and the powers that be twiddle their fingers and refuse us the right to restock?

(Facebook post, April 17, 2017)

This comment from the social media plane indicates that the decision to end stocking in Wales may have achieved certain policy goals but was not effective in ending conflict over hatchery use. Rather, the public consultation process and policy decision to end stocking further entrenched already polarized discourse coalitions.

The polarization and subsequent fractioning between the existing discourse coalitions had another, possibly beneficial, outcome: the emergence of a Middle Ground Coalition. This group had begun to emerge before and during the 2014 policy change process and the policy change created space for their discourses to gain attention within the Wye watershed. This coalition elevated concepts of compromise to create room for all parties at the salmon management table. It included fringe members of both the Recovery and Decline coalitions who believed that the River Wye was probably recovering

ecologically, but simultaneously acknowledged that there were great social divides that must be bridged in order for the Wye to recover in all aspects – socially, ecologically and economically. Crucially, it appears that although small in numbers, the members of the Middle Ground Coalition had the potential to achieve outcomes that leaders from the other coalitions could not. For example, a leader from the Recovery Coalition posted online:

As a group, we Wye anglers and owners, guides, ghillies, associations, trusts and seem to be committed to punching as far below our weight as we can. We have problems agreeing in many areas; we seldom agree to disagree and this is a gift to those who would have the river used for other things. So my plea for 2018 is to ask everyone to value the benefit of a more united front. Can we agree to disagree on some of the dividing areas and put right some of the bad things that affect it all and reclaim the lost ground? [sic throughout] (January 2, 2018, flyfishingforums [flyfishing.co.uk])

To which a Decline Coalition member replied to the original author:

Biggest load of cr\*p I have ever heard. Anyone who has had dealings with this man is unlikely to want to do so again in my opinion. Time the elephant left the room ASAP. [sic throughout] (January 4, 2018, Facebook)

Yet, the same sentiments were expressed in the social plane by a Middle Ground Coalition member who was reported as very well respected and admired by other interview participants:

Ultimately you try to get together a group of individuals who can work together, rather than spend three hours arguing. My fundamental sort of aim whenever I'm involved [with] the Wye is simply the good of the river, and the good of the salmon. And I don't really care whose side you're on or what your agenda is. The only thing I look at is I try to improve the salmon runs, and 'do you care about the river?' Providing those are your aims then I'm happy to try to work with you. [sic throughout] (D. Adams, June 23, 2018)

This discord indicates a power shift from polarized coalition leaders to centrist members of the emerging Middle Ground Coalition.

## 4 | DISCUSSION

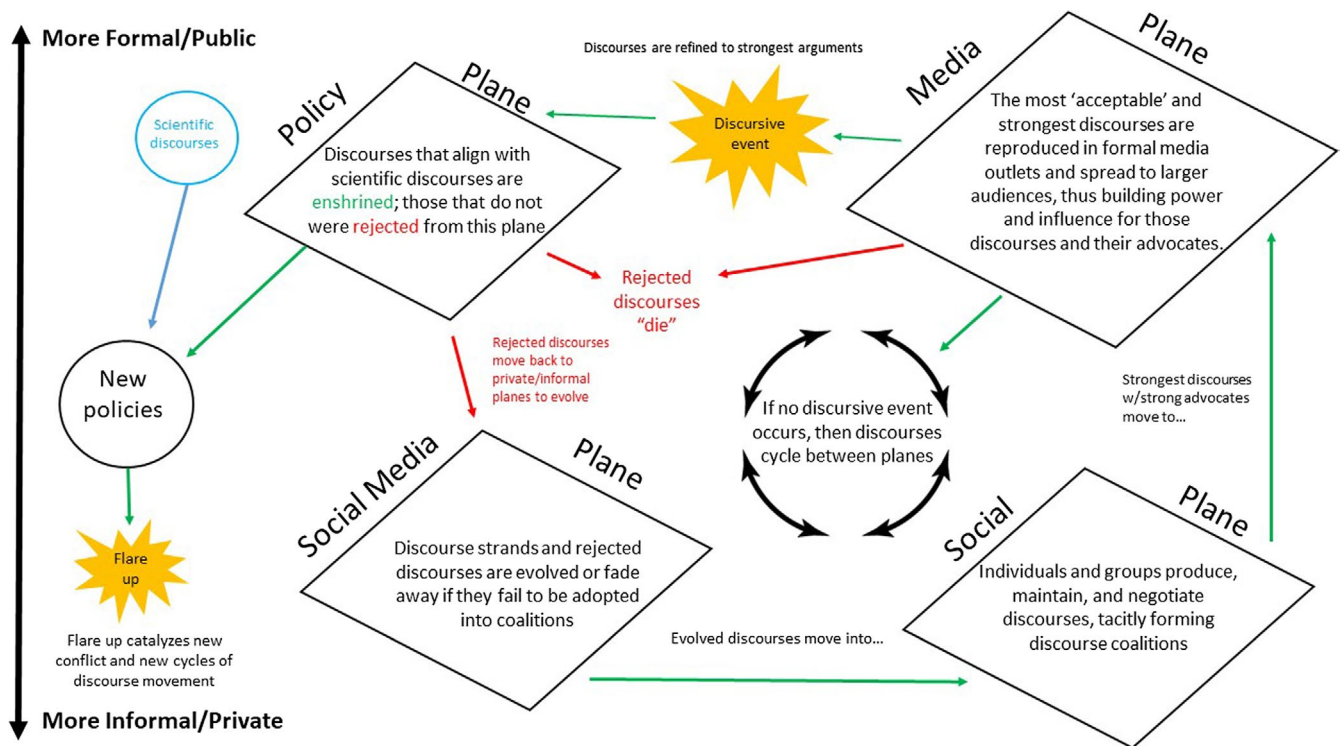
Sustainable fisheries management is constantly challenged by conflict over contentious issues (Arlinghaus, 2005; Charles, 1992), and our study is no exception. We analysed the stocking debate in the River Wye in Wales to understand conflict as it emerged over time

and across different discourse planes. The conflict can be characterized as three interacting tenets: (a) two opposing discourse coalitions with different values, worldviews and interests, and one emerging 'middle ground' coalition; (b) societal arenas – discourse planes – where the coalitions met at different times to debate contentious issues and (c) conflictive behaviour over stocking and contentious value and belief-driven issues was manifest but negotiated, then escalated, and then persisted in secondary spin-off conflicts well beyond the political decision to terminate the voluntary hatcheries.

The key conflict took place between two discourse coalitions who argued about salmon stocking from the position of stakeholder-specific values and beliefs. The two groups viewed the state of River Wye salmon fisheries differently due to divergent perceived ecological baselines (Pauly, 1995) for comparison of salmon abundance (Figures 1 and 3). Their respective appreciation of local and scientific knowledge (Harrison, Rybråten, et al., 2018) led to diverging views on the possible effects of habitat restoration versus stocking to conserve salmon stocks. This is a classic dilemma previously described in other fisheries management contexts where different stakeholder groups either favour habitat management as an indirect way of supporting fisheries or stocking as an immediate response to conserve declining fisheries (Arlinghaus & Mehner, 2003). The two coalitions also had different short- and long-term goals for Wye salmon, either wanting to sustainably use and conserve the resource as a 'natural' population in the long term (Harrison, Hauer, Nielsen, & Aas, 2019), or achieve robust salmon stocks via stocking in the short term. These goals indicate different value systems (e.g. different weights assigned to non-use and use values of fisheries resources (Hein, Koppen, Groot, & Ierland, 2006)) as well as different degrees of environmental discounting, such as preferring immediate current benefits over future benefits that may take too long to accumulate.

The key differences in perspectives among members of the different coalitions were expressed at different hierarchical levels, encompassing more general ecological worldviews as well as specific ideologies on how to best use and conserve a wild population of salmon. This value diversity resulted in the discourse to become complex and nuanced, not fitting the sometimes simplified discussion preferred by ecological scientists or conservation biologists that stocking is either ecologically 'good' or 'bad' (Araki & Schmid, 2010; North Atlantic Salmon Conservation Organisation, 2017; Waples, 1999). Instead, for many stakeholders, particularly those of the pro-stocking coalitions, the practice of stocking appeared to constitute a symbolic action to serve much more basic values and beliefs about the importance and functioning of wild salmon populations. Reducing the stocking debate to just an ecological question thus alienated some stakeholders, fostering persistent spin-off conflicts.

Each plane allowed for different types of discourses to develop based on characteristics of the plane (e.g. private vs. public, formal vs. informal). Importantly, discourses appeared across and moved between planes in response to events, indicating an ongoing negotiation wherein discourses move, evolve, are maintained or are forgotten if not reproduced (Figure 4). For example, the anonymity of



**FIGURE 4** Discourse Plane Dynamics. Discourses are produced by discourse coalitions and then appear, move, and evolve (or disappear) across planes due to discursive events, strong discourse advocates, and windows of opportunity

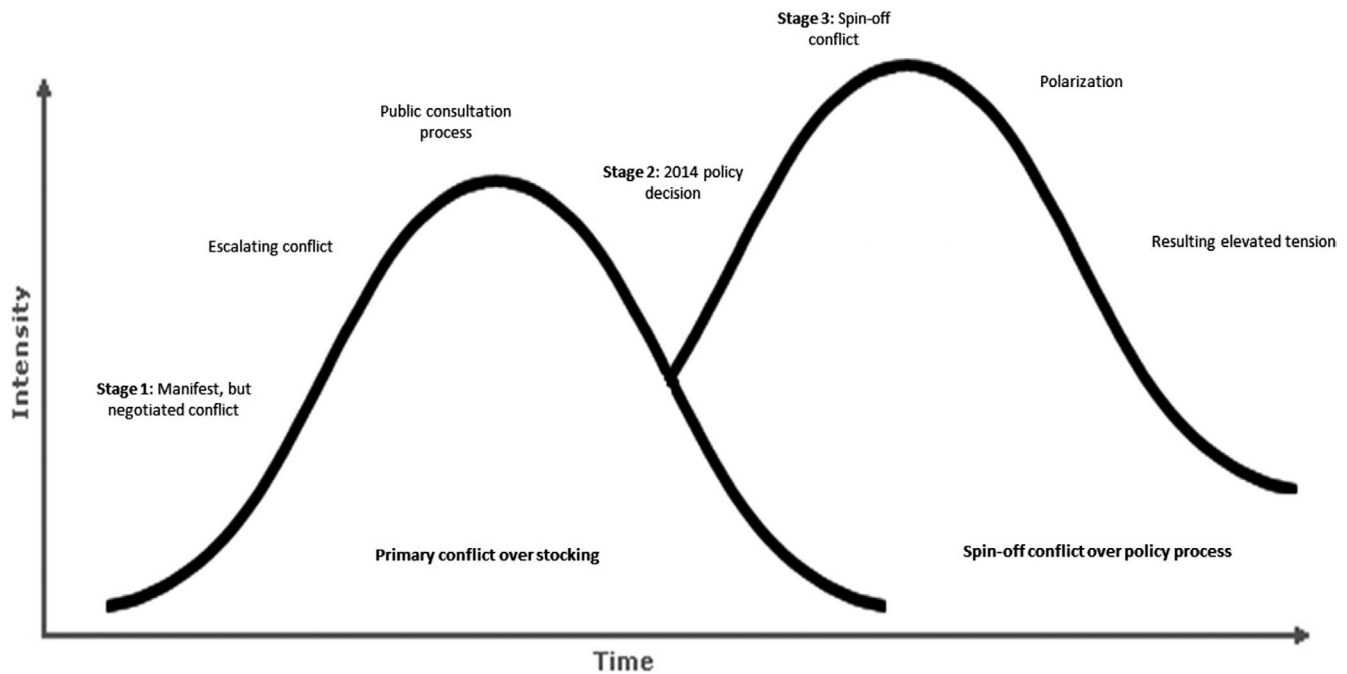
the social media plane allowed ideas and theories about the state of Wye salmon to evolve, later re-emerging into social and media planes when a suitable discursive event, or 'flare up' took place (Figure 4). This process explains how certain discourses gained dominance and eventually were enshrined in formal policy. For example, the decision to end stocking was influenced by the Recovery Coalition successfully linking its pro-habitat improvement discourse to scientific uncertainty about the effects of stocking and economic efficiency debates, discourses already of concern among management and science representatives. This finding demonstrates that to steer public policies, it is not enough to be involved on a single level of discussion. Since discourses can reappear in different contexts, merge with other arguments, and continue to exert social influence, fisheries managers need to sincerely listen to and address concerns and arguments in various, even difficult to access, social spaces that might be critical of management decisions. Our case study is likely exemplary for many ongoing participatory processes debating contentious natural resource management issues, such as protected area management or planning of fisheries regulations.

## 5 | UNDERSTANDING CONFLICT IN STAGES

Understanding now what the Welsh stocking conflict was about and where it took place, one can then view the complex stocking debate as conflict evolving over three stages (Figure 5). In Stage 1 prior to the policy decision, stocking was already perceived as a conflictive

issue by the involved actors and the conflict was observable from the outside, showing that the River Wye stocking debate was at the stage of 'manifest conflict' (Glasl, 1982). During this stage, the hatchery debate waxed and waned in intensity based on events such as policy changes and shifts in stock size. According to the media plane, there was increasing polarization between the stakeholder groups during the 2000s, yet projects like the semi-natural rearing ponds and habitat improvement grants offered ways by which groups could disagree amicably and still pursue their own salmon conservation goals.

Stage 2 of the conflict was the 2014 policy change to terminate voluntary stocking which, importantly, was not the government's reaction to an escalating conflict. Instead, the reorganization of Welsh resource management agencies acted as an externally-induced 'disturbance' to the manifest-but-negotiated conflict. Thus, the developments of the River Wye salmon fishery could be seen as an example of social-ecological regime shift (Capon et al., 2015) where low salmon stocks and shifting power dynamics enabled new policy to emerge during a window of opportunity for change (Holling & Gunderson, 2002), and fundamentally changed the human-nature interactions from multiple means of salmon conservation engagement to only habitat improvement practices. However, this change occurred in neither an empty, a-political or a-social atmosphere (Holland, 2002; Kooiman & Jentoft, 2009), and though the long-term ecological consequences of (not) stocking the Wye are still unknown, we observed social consequences, such as increasing stakeholder polarization and diminished trust in management. In essence, the 2014 policy decision acted as a crucible for the previously



**FIGURE 5** Conflict progression in three stages. Adapted from Pondy's model of organizational conflict (1967)

manifest conflict where multiple beliefs and values were distilled to one dominant set, effectively dismissing the remaining discourses and, inherently, those who held them.

Importantly, we observed the debate to persist in some planes well beyond the termination of the voluntary hatcheries. This can be explained by the policy decision not properly addressing the underlying latent social issues such as opposing worldviews and values about stocking described in this case study. This is not a critique to the policy makers specifically, as changing fundamental values of people is fundamentally difficult, if not impossible (Manfredo et al., 2017). However, beliefs and attitudes may be changed through joint learning and proper processes (Fujitani, McFall, Randler, & Arlinghaus, 2017), which did not happen in our case study. Because of the persistence of basic value and belief clashes, the conflict did not follow a typical path toward resolution or suppression (Pondy, 1967). Instead, the immediate consequence of those remaining unresolved tensions was the emergence of Stage 3, a spin-off conflict (Figure 5) over the policy-making process and, more specifically, over the consultation process leading to the decision itself. A key finding of this study is how Stage 3 can be explained by two interrelated factors.

(1) Prior to 2014, the ongoing debates between different groups formed a contentious but relatively stable regime state in which multiple ecological realities and understandings of stocking coexisted. Although the issue of hatcheries and stocking was contentious, the potential for future win-win outcomes (McShane et al., 2011) (real or imagined) existed. The consultation framed stocking and hatcheries as a binary choice to support or reject and suggested that hatcheries were about ecological effectiveness only. Our analysis showed that stocking and habitat restoration measures were not always been seen as opposites, and the stocking debate was discursively

entangled with many other issues. Thus, the consultation forced a wide array of opinions and concerns into a narrow band of ecologically oriented alternatives based on incomplete local data.

The consultation process was meant to represent different opinions and evidence, but it simultaneously reproduced and strengthened positions on these issues instead of seeking compromises or taking into account all relevant aspects of the stocking debate (e.g. social concerns, pro-stocking evidence). Effectively, it eliminated the possibility for multiple realities about the outcomes of stocking to co-exist and restricted the opportunity for fruitful discussions about stocking, effectively creating winners and losers amongst stakeholder groups (Cinner et al., 2014). This outcome indicates that fisheries managers must be aware of the dialectic nature of participatory processes and that their actions and decisions create, reproduce and suppress discourses (Figure 4).

(2) Members of the Decline Coalition had difficulty accepting the decision to end stocking because hatchery advocates expected the public consultation to be a democratic and participatory process where all discourses concerning stocking would be heard and held in consideration equally. In this case, managers chose a public consultation process which did not allow for two-way negotiation or exchange of information (Rowe & Frewer, 2005). That process did not fulfil Decline Coalition expectations to participate in the policy-making process, and thus was perceived as a violation of the established rules of the game (compare Jentoft, McCay, & Wilson, 1998). As shared and trusted procedural rules are one of the foundations enabling stakeholders to operate and negotiate within a safe space (Maguire & Lind, 2003), this perceived violation intensified conflict during and after the consultation process. While such conflict could be regarded as a sign of an active stakeholder base and consultation processes are not necessarily intended to address or relieve conflict

(see Singleton, 2009), this study demonstrates the social discord and persistent polarization that can arise if conflict is not managed carefully, a point NRW officials recognized as important to learn from and improve. Thus, the consultative approach was not able (or appropriate) to relieve conflict between the discourse coalitions who were already accustomed to and engaged in an ongoing negotiated debate. This demonstrates that participatory processes need to adhere to principles of good governance (Costanza et al., 1998; Sissenwine & Mace, 2003) such as fairness and transparency both to adhere to established norms and to effectively reach their goals.

These two factors help explain why the policy decision resulted in unexpected costs in the form of loss of potential economic and social capital for habitat improvement projects from Decline Coalition members, social capital amongst salmon interests groups (Harrison, Kochalski, et al., 2018), and goodwill and trust from Decline Coalition members toward other stakeholder groups (particularly managers). A key point shown by our study is that acting solely on ecological principles can threaten other valuable assets to conservation, such as local capacity to act and social cost-effectiveness (Recuerda, 2008). This finding points toward the danger of failing to address social objectives alone is likened to ignoring a broken leg on a three-legged stool; environmental and economic objectives will fail to bring about sustainability if not supported by *satisfied* social objectives (Fabinyi, Evans, & Foale, 2014). In short, managers cannot simply consider social objectives but must genuinely treat them as important, and management frameworks must be written to allow for that outcome. These findings raise the question: was the process that created the social conflict, and its associated negative impacts, necessary to achieve the ecological goal of ending stocking on the Wye, and what processes could have achieved both ecological *and* social objectives?

## 6 | WAYS FORWARD

In River Wye salmon stocking discourse, the issue of evidence emerged as a dominant theme in the policy and social planes, indicating that different stakeholder groups judge evidence about the efficacy of stocking differently. There was great interest from all parties for an improved knowledge base, but continuous ecological monitoring and studies can be difficult to fund (Walters, 2007) and are logistically difficult to implement on the River Wye (P. Gibson, pers. comm., June 18, 2016). Even if such projects were funded, their outcomes could still be interpreted differently, a common feature of fisheries management operating under uncertainty about the state of the resource and the robustness of scientific assessments (Fulton, Smith, Smith, & Putten, 2011; Hutchings, Walters, & Haedrich, 1997). Recognizing the existence and validity of different answers, along with clear objectives and explicit, shared goals, is a prerequisite for finding shared ways forward (Harrison, Kochalski, et al., 2018; Redpath et al., 2013). As such, we conclude that any meaningful next steps should include transdisciplinary active management experiments designed for joint learning (Fujitani et al., 2017) about

stocking trade-offs, which may be a suitable alternative to the 'either-or' consultation process exercised in this case study that mainly fostered sustained stakeholder conflicts and created winners and losers rather than leading to joint production of knowledge and understanding. In this case, collaborative decision-making strategies in which decision-makers seek to engage all stakeholders in finding mutually acceptable solutions would likely have been more effective at achieving productive, shared outcomes (Roberts, 2000). Such strategies include joint fact finding (Gray, Hatchard, Daw, & Stead, 2008) and adaptive experimentation where different stakeholder groups, including scientists and managers, work together to obtain evidence that is mutually accepted (Fujitani et al., 2017). In the Wye, such an approach was started through the primarily privately funded stocking experiment using semi-natural rearing ponds, but came to a premature end. Looking back, it would have been prudent to initiate this type of project and, importantly, carry it through with respect to the established social contract between the participating parties and time required to collect rigorous scientific data on salmon. Implementing adaptive management inherently requires that managers are working within national or international management frameworks that allow them to prioritize these stakeholder-inclusive approaches, which we have demonstrated was a limiting factor within the Welsh case. We posit that had the Welsh managers been working within a regulatory framework that allowed them to postpone or avoid the binary choice to leave open or terminate stocking programs, alternative approaches that achieved multiple and shared objectives may have been possible.

The emergence of the consensus-oriented Middle Ground Coalition reflects action organized around the shared interests of its stakeholders. River Wye managers could take advantage of the emergence of this coalition by allowing them to lead affected stakeholders into active planning and policy-making participants, and by attending to multiple ecological and social conservation objectives. However, as with participatory adaptive management (Fujitani et al., 2017), collaborative management are time- and energy-consuming processes (Rittel & Webber, 1973), and the Middle Ground coalition may be effective insofar as they can address social conflicts, but not entrenched environmental or climatic challenges. Thus, pursuing interventions to perceived problems, rather than outright solutions, and collaborative strategies that allow competing stakeholder groups to work toward shared realities and achieve multiple objectives (Harrison, Rybråten, et al., 2018) could be a productive way forward in mitigating or avoiding future conflicts.

## CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

## AUTHORS' CONTRIBUTIONS

All authors listed have participated substantially in the manuscript's development. H.L.H., S.K., Ø.A. and R.A. designed the study. H.L.H. and S.K. collected the data; H.L.H. performed the analysis. H.L.H.,



S.K., R.A. and Ø.A. interpreted the data and wrote and edited the manuscript and its revision. All authors approve the final version.

## ETHICAL APPROVAL

All data collected and used in this study was collected with approval from and in accordance with the Norwegian Centre for Research Data Authority standard via project #47203. Informed consent was obtained from all participants in this study.

## DATA AVAILABILITY STATEMENT

The data used in this study include recorded and transcribed interviews, which will be archived at the Norwegian University of Life Sciences per that institution's archiving rules and practices but are not available from that institute by request. Data are not publicly available or available through the archiving institute because they include sensitive interview data. The data may be made available by request to the corresponding author, and with permission of all parties involved with the research. All other data used in the study are publicly available online at locations referenced in the article (see Data Sources and Reference list).

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## DATA SOURCES

### Media Plane Analysis Sources

1. NRW staff survey aims to 'get under skin' of negativity  
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<http://www.bbc.com/news/uk-wales-42012809>

2. To: George Eustice MP, Minister of State at DEFRA, Lesley Griffiths AM – Cabinet Secretary for Environment and Rural affairs and The First Minister of Wales, Carwyn Jones (Petition). Give Welsh Fishing Clubs and Salmon and Seatrout a Chance  
Campaign by Reuben Woodford  
November 2017  
<https://you.38degrees.org.uk/petitions/give-welsh-fishing-clubs-and-salmon-and-seatrou-t-a-chance?source=facebook-share-email-button&time=1510729717>
3. River Wye salmon catch hits 20-year high  
3 July 2016  
<http://www.bbc.com/news/uk-wales-south-east-wales-36686081>
4. Bumper spring for salmon fishing in Wye  
30 June, 2015  
[http://www.herefordtimes.com/news/13362032.Bumper\\_spring\\_for\\_salmon\\_fishing\\_in\\_Wye/](http://www.herefordtimes.com/news/13362032.Bumper_spring_for_salmon_fishing_in_Wye/)
5. Wye enjoys best spring salmon in two decades  
June, 2015  
[http://flyfishing-and-flytying.co.uk/news/view/bye\\_enjoys\\_best\\_spring\\_salmon\\_in\\_two\\_decades/](http://flyfishing-and-flytying.co.uk/news/view/bye_enjoys_best_spring_salmon_in_two_decades/)
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3 October 2014  
<http://www.bbc.com/news/uk-wales-29475698>
7. Corwen salmon hatchery closure to be decided by Natural Resources Wales  
2 October 2014  
<http://www.dailypost.co.uk/news/north-wales-news/battle-save-welsh-salmon-stocks-7873009>
8. Welsh salmon stocking under threat  
April 11, 2014  
<https://www.hatcheryinternational.com/news/welsh-salmon-stocking-under-threat-1642>
9. North Wales: Fears for salmon numbers as hatcheries set to close  
6 March, 2014  
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10. Three salmon hatcheries in north and mid Wales under threat.  
4 March 2014  
<http://www.bbc.com/news/uk-wales-26437099>
11. Fish legal calls for action to restore wild fisheries after closure of hatcheries in Wales  
2014–2015 (actual date unknown)  
<http://www.fishlegal.net/page.asp?section=1050#>
12. Salmon numbers rise in river Wye tributaries Lugg and Arrow  
30 October 2013  
<http://www.bbc.com/news/uk-wales-mid-wales-24738260>
13. Rivers Wye and Usk salmon catches increase  
November 25, 2012  
<http://www.bbc.com/news/uk-wales-20486105>
14. Wye monster salmon return  
Friday 30 March, 2012  
<http://www.bbc.co.uk/blogs/wales/entries/59feb81-288d-3e48-b154-e060c9ef30c7>
15. Salmon numbers leap to reverse two decades of decline in UK rivers  
26 June, 2011  
<https://www.theguardian.com/environment/2011/jun/26/salmon-numbers-leap>
16. Fisheries Minister Richard Benyon supports River Wye's move  
5 March, 2011  
[http://www.herefordtimes.com/news/features/farming/8884694.Fisheries\\_Minister\\_supports\\_River\\_Wye\\_s\\_move](http://www.herefordtimes.com/news/features/farming/8884694.Fisheries_Minister_supports_River_Wye_s_move)
17. Thousands of salmon released into Severn  
20 October, 2010  
<http://www.theforestreview.co.uk/article.cfm?xml:id=403&headline=Thousands%20of%20salmon%20released%20into%20Severn&sectionIs=news&searchyear=2010>
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June 17, 2009  
<https://www.anglingtimes.co.uk/fishing-news/2009/stockings-put-uk-rivers-in-top-form>
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<http://www.independent.co.uk/news/plot-is-hatched-to-save-wyes-salmon-1307351.html>
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Social Media Sources
24. Fishing Thread  
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<http://www.fishingthread.com/forum/hatcheries-closing-in-wales/4954-aber-cynrig-hatchery-to-close-will-all-welsh-hatcheries-close-all-stocking-stop>
25. Wye Salmon Association Forum  
November 20, 2017  
<http://www.wyesalmon.com/community/salmon-stocking/fin-clips/#post-64>
26. Fishing thread – River Wye – Wye Results  
April 2013  
<http://www.fishingthread.com/forum/welsh-rivers/river-wye/107-wye-results-2013/page18>
27. Facebook – Wyebank and Courtfield Spring Salmon Syndicate  
<https://www.facebook.com/wyebanksyndicate/>
28. Facebook - Wye Salmon Association  
<https://www.facebook.com/WyeSalmonAssociation/>
29. Facebook – The Wye and Usk Foundation  
<https://www.facebook.com/wyeusk/>

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<https://doi.org/10.1002/pan3.10049>