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Uncharted waters: Exploring coastal recreation impacts, coping behaviors, and attitudes towards offshore wind energy development in the United States

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ABSTRACT

United States offshore wind energy development (OWD) is poised to expand significantly in the coming decade as a result of substantial wind resources adjacent to large population and coastal load centers. A significant portion of OWD infrastructure may be sited within or adjacent to parks and protected areas, raising concerns about the potential social, situational, and ecological impacts upon coastal recreation. This novel study investigated the influence of perceived recreation impact and coping behaviors upon coastal recreationists' general attitudes towards potential OWD at the New Hampshire seacoast. On-site surveys were used to collect data from New Hampshire coastal recreationists from June to September of 2019 (n = 553). The study sample's perceptions towards the acceptance, support, fit, and recreation impact of OWD at the New Hampshire Seacoast was largely supportive and positive. The overall sample perceived the presence of OWD would not cause them to alter or substitute their recreation activities, behaviors, or experiences. Moreover, structural equation modeling suggests perceived recreation impact and coping behaviors are significant predictors of general attitudes towards OWD. Further, a lack of measurable effect from photo-elicitation priming suggests viewshed impacts and the spatial proximity of OWD siting did not have a significant influence upon general attitudes towards OWD. This research offers critical insights into the theories of stress-coping and landscape fit and calls into question the assumption that situational factors such as OWD act as a stressor on coastal recreation. This study found that OWD will likely have little impact on aggregate coastal recreation visitation, and in some instances, may even amplify visitation. This research demonstrates the importance of evaluating coastal recreationists' perceptions, behaviors, and attitudes from a social-ecological approach when initiating OWD projects in the United States and abroad.

1. Introduction

The implementation and expansion of renewable energy systems worldwide has been broadly recognized as a critical step towards the reduction of greenhouse gas emissions largely responsible for global climate change [1]. While offshore wind energy development (OWD) is one of the most abundant and feasible renewable energy resources in the United States, it has been slow to develop for various socio-political and ecological reasons [2-5]. However, due to recent state-level policies and initiatives, capital investments, and substantial wind resources adjacent to large population and coastal load centers, the United States is now well positioned for an OWD boom [3,6]. While the United States' first OWD project, a 30-MW pilot project, began operation off of Rhode Island in 2016, there are now more than 20 commercial-scale OWD projects planned for development off the Northeastern Seaboard in the coming decade [3,6,7]. A significant portion of this OWD may be located

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within or proximate to parks and protected areas used extensively for coastal recreation.

This study examined coastal recreationists' attitudes towards potential OWD at the New Hampshire seacoast. Recreation is an essential sector of the New Hampshire economy, accounting for $8.7 billion in annual consumer expenditures, generating more than $528 million in state and local tax revenue, and directly supporting over 79,000 jobs [8,9]. A substantial portion of New Hampshire's recreation visitation and associated expenditures revolve around the states' 18 miles of coastline. Coastal recreationists are critical stakeholders within the OWD realm as they will likely have firsthand encounters with this type of energy development. As such, policymakers, natural resource managers, and the OWD industry need to align with this important and vocal constituency in an effort to provide an equitable and transparent experience for all stakeholders. Conventional wisdom regarding the relationship between OWD and coastal recreation may be oversimplified, as it often assumes recreationists are mostly interested in uninterrupted views and will thus be negatively impacted by OWD [10,11]. This study found positive attitudes towards OWD at the New Hampshire seacoast, with respondents indicating relatively high levels of support, landscape 'fit', and acceptance. Moreover, study respondents perceived OWD would positively impact their coastal recreation experience and likely not require them to alter their recreation activities, behaviors, or experiences. This conceptually and methodologically novel study is one of the first to apply a modified stress coping framework and examine the effects of photo-elicitation priming within the context of energy development in a coastal recreation setting. Study findings highlight the perceived influence of OWD upon the coastal recreation experience in addition to the importance of evaluating coastal recreationists' perceptions, behaviors, and attitudes when initiating OWD projects in the United States and around the world.

2. Literature review

2.1. General attitudes towards offshore wind energy development

As worldwide renewable energy development has become prevalent, the conversation related to OWD has increased considerably. While many countries have welcomed this form of renewable energy development, OWD has developed slowly in the United States for various socio-political and ecological reasons [12,13]. However, recent state-level policies have begun to embrace OWD, and research has demonstrated Americans' attitudes towards OWD have generally trended towards acceptance and support [4,7,12,14]. Numerous studies have suggested that general attitudes towards OWD may be contingent upon project transparency, attributes of the specific project, proximity to development, visual and auditory impacts, demographics, perceived 'fit', and overall support and opposition [4,13,15-18]. While perceptions of OWD in the United States have traditionally been built upon general attitudes, a more complex relationship likely exists [7,19].

Several studies have applied the theory of landscape fit, where an individual's perception of the 'fit' between an energy development project and the symbolic meaning of a landscape, community, or location may ultimately influence an individual's general attitudes towards various forms of energy development [4,15,20-24]. For example, Devine-Wright and Howes [15] suggested the concept of 'fit', or how an energy development project is socially constructed or perceived by a community, may be more important in explaining general attitudes, than the physical aspects of an energy development project. Research suggests that an individual's place attributes or values they assign to individual place settings, may influence general attitudes towards OWD depending on the perceived 'fit' of the project within the landscape, community, or location [4,7,25,26]. For example, the sustainable and novel aspects of OWD may be perceived positively amongst coastal recreationists who view OWD as an alternative energy solution that may also increase recreation opportunities in parks and protected areas [4]. As such, the 'fit' of energy development within a landscape, community, or location could be an indicator of continuity or disruption, which may be a core component of general attitudes towards energy development projects [27,28]. Within this study context, the industrial aspects of OWD may or may not 'fit' the symbolic meaning that coastal recreationists have developed for the New Hampshire seacoast landscape, community, or location.

2.2. Perceived impacts of offshore wind energy development upon coastal recreation

Much research in Europe and North America has examined public attitudes and perceptions towards OWD [7,16,17,21,29]. For example, Haggett's [17] robust synthesis of the literature concluded that a litany of factors likely influences the general public's responses to OWD such as visual impact, seascape value, local attachment, trust in developers, and opportunities for involvement. Within these studies, coastal recreationists are often treated as a secondary pursuit or afterthought. The term 'coastal recreation' refers to a wide array of water-based recreation activities such as angling, boating, sightseeing operations, surfing, and beach use. Coastal recreationists are critical stakeholders within the OWD process as they will likely have firsthand encounters with situational factors such as OWD, in addition to their strong ties with both the natural resources and the communities [4,25]. Situational factors refer to interactions with the built environment that may influence visitor perceptions, behaviors, or experiences [30]. In this study context, OWD is seen as a situational factor that may have a significant influence upon the overall recreation experience and social-ecological system. Moreover, OWD by its nature is located within close proximity to coastlines, which may influence coastal recreationists' visitation behaviors and general OWD attitudes [18,31]. Research has suggested the importance of understanding coastal recreationists' perceived impacts, behaviors, and attitudes related to OWD [19,25], yet this area of inquiry has presented various complexities that require further empirical examination.

One stream of research has proposed that OWD may negatively impact coastal recreation [31-34]. At a basic level, these perceived negative impacts often stem from viewshed impacts, auditory impacts, and avian mortality [35,36]. However, a more thorough examination reveals that perceived negative impacts and associated behaviors often relate to the spatial proximity of OWD sites to the coastline [31-34]. For instance, Lilley et al. [31] found that one-quarter of coastal recreationists would select an alternative coastal location if an OWD site was located six or fewer miles from shore. While Parsons et al. [33] found that more than one-quarter of coastal recreationists reported they would make fewer trips to the coast if an OWD site was located less than two and a half miles from shore. These findings suggest that as the distance of OWD siting from shore increases, coastal recreationists' behavioral changes often diminish [31,33]. Collectively, these studies have concluded that the majority of coastal recreationists would not change their behaviors as a result of OWD project implementation [31-34].

While OWD can be perceived as negatively impacting coastal recreation, a second stream of research has proposed that OWD may positively impact the coastal recreation experience [4,18,31,32,37-39]. For example, OWD sites may present novel coastal recreation attractions and new opportunities such as sightseeing to visit and view OWD sites [31,33,38-41]. Moreover, OWD foundations have been shown to act as artificial habitats and structures for marine life, increasing angler catch rates and providing scuba diving opportunities [39,41-43]. Overall, this second stream of research has suggested the presence of OWD may have little impact on aggregate visitation, and in some instances, may even amplify coastal recreation visitation [4,18,19,31,32].

The findings from this burgeoning area of research are conflicted and there is evidence to support both sides of the debate surrounding the impacts of OWD upon coastal recreation. Geographic, political, and methodological differences largely confound comparability and few empirical investigations have been conducted. Researchers seem to

agree though, OWD has the potential to positively and negatively impact coastal recreation demand and visitation [4,18,31-34,37-39]. Moreover, studies have suggested that perceived recreation impacts from OWD may be a critical predictor of general OWD attitudes among coastal recreation populations [4,7,19,25]. This is especially likely in locations characterized by substantial wind resources proximate to popular coastal recreation destinations [44], such as the New Hampshire seacoast. Thus, further investigation into these complex relationships is warranted.

2.3. Stress-Coping and substitution theories

The theoretical foundations of Folkman and Lazarus's [45] transactional stress-coping framework postulate that an individual may employ various coping mechanisms in an attempt to manage situations perceived as negative, undesirable, or stressful. The coping framework consists of three primary components: 1) influencing factors, 2) coping mechanism, and 3) outcomes [45-47]. Influencing factors refer to a combination of personal factors (e.g., beliefs or commitments) and/or situational factors (e.g., novelty or uncertainty); for instance, beliefs about the impacts of OWD upon recreation [45-47]. Coping mechanisms consist of cognitive and/or behavioral responses (e.g., substitution and displacement) that serve to mediate the relationship between influencing factors and desirable outcomes; such as alterations to the recreation experience when encountering OWD [45-47]. Outcomes refer to short-term outcomes with immediate consequences (e.g., positive or negative attitudes) and/or long-term outcomes with gradual consequences (e.g., future behavioral intentions); for instance, general attitudes towards OWD [45-47]. The underlying premise of the framework suggests that, when faced with a negative, undesirable, or stressful scenario, an individual may engage in a mediating appraisal process where they internally assess all possible coping alternatives and identify and implement the most salient coping response in pursuit of a desired outcome [45-47].

Within the recreation literature, a substantial amount of research has adopted various forms of the coping framework [45,47]. For instance, several researchers have adapted and integrated the behavioral components of the coping framework with the empirically validated recreation substitution typology [45-49]. The substitution typology consists of various substitutive behavioral alternatives that recreationists may employ when facing undesirable conditions in an effort to maintain their desired outcome [46,48,49]. The most common forms of substitution are resource substitution, activity substitution, avoidance, and displacement [46,49-53]. Resource substitution refers to a recreationist maintaining their preferred activity but visiting a different location [46-50]. Activity substitution refers to a recreationist maintaining their preferred location, but changing their activity [46-50]. Avoidance refers to a recreationist temporarily distancing or ceasing participation in both the recreation setting and the activity [46-50]. Finally, displacement refers to a recreationist permanently abandoning participation in both the recreation setting and the activity [46-51].

A majority of these recreation studies have applied the coping framework within the context of negative, undesirable, or stressful *social* factors (e.g., crowding, conflict, hassles) [46,48,54]. In addition to these social conditions, another lesser studied element that can impact the overall recreation experience are *situational* factors (e.g., energy development) or visitor interactions with the built environment [47]. These conditions, whether social or situational, are theorized to cause anguish or distress for the recreationist, which can ultimately influence their attitudes and behaviors [46,47]. Within this context, it is conceptualized that the presence of OWD along the New Hampshire seacoast may cause distress for coastal recreationists which may influence or alter their behaviors and attitudes. Although prior research established a relationship between energy development and general attitudes [18,20,25], none of these studies have used the coping framework to explain this phenomenon from a social-ecological perspective. Moreover, to these authors' knowledge, no studies have applied the coping framework within the context of energy development in a coastal recreation setting. This study addressed these gaps by using a modified coping framework to explore the extent to which perceived recreation impacts from OWD and coping behaviors relate to coastal recreationists' general attitudes towards OWD at the New Hampshire seacoast.

2.4. Research questions

In light of the literature, the researchers expected perceived recreation impacts of OWD and coping responses to influence attitudes towards New Hampshire OWD. A more thorough investigation of these relationships was warranted to advance the literature and help policymakers, natural resource managers, and the OWD industry engage coastal recreationists in the OWD process. This study sought to address the following research questions:

R[1]: What are coastal recreationists' general attitudes towards OWD at the New Hampshire seacoast?
R[2]: What are coastal recreationists' perceived recreation impacts and coping behaviors towards OWD at the New Hampshire seacoast?
R[3]: To what extent do coastal recreationists' perceived recreation impacts and coping behaviors relate to general attitudes towards OWD at the New Hampshire seacoast?

3. Methods

3.1. Study Area- the New Hampshire seacoast

The New Hampshire seacoast is home to a multitude of public and private parks and recreation facilities, which serve the primary purpose of providing access to the Atlantic Ocean. Through conversations with natural resource managers, owners, operators, and local stakeholders, the researchers obtained permission to sample visitors at 18 survey locations along the 18-mile New Hampshire seacoast. These survey sites included five state parks, two municipal parks, two state marinas, three commercial marinas, three charter boat operations, two sightseeing operations, and one yacht club. Combined, these 18 survey sites contained: five marinas, eight boat launches, seven angling locations, and four beaches. These sampling sites are representative of the Atlantic Ocean sites used by recreationists along the seacoast. Within the New Hampshire seacoast, coastal recreation is an essential sector of the state economy, accounting for more than $1.5 billion in economic impact and supporting more than 10,000 jobs [8,9]. It should also be noted there are multiple inland water-based recreation resources within close proximity to the New Hampshire seacoast (e.g., Great Bay Estuary, Piscataqua River, Hampton Harbor). These inland resources provide both in-state and out-of-state recreationists with similar water-based recreation opportunities.

3.2. Data collection

On-site surveys were used to collect data from New Hampshire coastal recreationists throughout the New Hampshire seacoast from June to September of 2019. To generate a representative sample, the research team developed a systematic sampling plan to coincide data collection with peak coastal recreation visitation [55]. The 10–15-minute survey was administered by a trained research assistant via a tablet computer using Qualtrics data collection software which streamlined both the survey and data entry processes. The trained research assistant requested participation from every fourth person or party encountered [55]. Only adults (18 +) who consented were eligible to participate in the survey.

The questions in the first section of the survey revolved around trip visitation patterns. Once this section of the survey was finished, respondents received one of two informational flashcards. *Flashcard A*

provided approximately one-half of respondents (49.9%) with a brief informational narrative about OWD. The narrative read, "Offshore wind energy development refers to the use of wind turbines constructed in bodies of water to convert wind energy into electricity". *Flashcard B* provided the other approximately one-half of respondents (50.1%) with the same brief informational narrative about OWD, as well as a photo simulation of a hypothetical OWD project (Fig. 1). The hypothetical 600 MW OWD project consisted of 100 6 MW GE Haliade wind turbines in 10 rows of 10 turbines each, located 10 miles from shore. The hypothetical turbines have a rotor diameter of 500 feet, a hub height of 328 feet, and are spaced eight rotor diameters (0.75 miles) apart. The hypothetical photo simulation metrics were selected as they represent a potential location and scale of OWD at the New Hampshire seacoast [56]. For proper viewing, respondents were instructed to view the hypothetical photo simulation eight inches away from their face (two times the height of the image). Neither the flashcards nor the photo simulation identified any specific OWD sites, metrics, or OWD related risks or benefits. The purpose of these flashcards was twofold. First, to orient respondents, in an unbiased manner, to the basic premise of OWD. Second, to methodologically examine the possible effects of photo-elicitation priming upon respondents. Various energy development researchers have utilized similar flashcard and photo-elicitation techniques [4,31-34,57].

Once respondents reviewed the flashcard, they were then asked multiple questions pertaining to OWD. These questions centered on the perceived recreation impact, coping responses, acceptance, support, and landscape fit related to OWD at the New Hampshire seacoast (see section 4.1 for more details). The final portion of the survey included sociodemographic characteristics. This process yielded a 75% response rate, with 735 potential respondents being approached and 533 respondents completing the survey. Photo-elicitation priming was assessed across all study variables. A series of independent samples *t*-test analyses found no significant difference ($p < .05$) within any study variables between respondents who viewed *Flashcard A* and respondents who viewed *Flashcard B*. Thus, a lack of photo-elicitation priming bias was assumed, and for the analyses reported, both conditions were pooled into one single sample. Descriptive statistics were analyzed using Statistical Package for the Social Sciences version 24.0 and structural equation modeling (SEM) statistics were analyzed using Mplus version 8.4. To address research questions R^1 and R^2, frequencies, valid percentages, and measure of central tendency were used. To address research question R^3, SEM was used to assess the relationship between perceived recreation impact, coping behaviors, and general OWD attitudes. SEM was employed in this study as it offers instant and direct model comparisons, provides supplementary indicators of statistical fit, and creates overall stronger and more predictive models [59].

4. Results

4.1. Descriptive statistics

Of the 553 survey respondents, approximately 58% identified as male and 42% as female (Table 1). The average age of respondents was 46 years. A large majority of respondents (94%) reported their race/ethnicity as White. Other ethnicities reported included Spanish/Hispanic/Latino, African American, and Asian. Over one-half (54%) of the sample reported earning a four-year college or graduate/professional degree. The political ideology distribution within the sample was relatively even, with about 30% of respondents identifying as liberal, about 42% of respondents identifying as moderate, and about 28% of respondents identifying as conservative. On a seven-point Likert scale (1 = extreme liberal, 7 = extreme conservative), the mean for political ideology was 3.92, suggesting the sample was leaning slightly toward the liberal side of moderate.

Respondents were asked to specify their primary coastal recreation activity on the day they were sampled (Table 2). Commercial charter

Table 1
New Hampshire Coastal Recreationists' Sociodemographic Characteristics.

Variable	% or Mean	*n*
Gender		
Male	57.9%	320
Female	41.8%	231
Age		
Average age	46 years	
18–35	29.3%	161
36–50	26.4%	145
51–64	30.4%	167
65 and Older	14.0%	77
Race/Ethnic Background		
White	94.4%	493
Spanish/Hispanic/Latino	1.9%	10
Other	3.7%	19
Education		
Less than High School	greater than1.0%	1
Some High School	1.4%	8
High School Graduate	12.3%	68
Some College	20.4%	113
Two Year College	11.6%	64
Four Year College	33.8%	187
Graduate or Professional Degree	20.3%	112
Political Ideology[a]		
Mean	3.92	553
Liberal	29.7%	164
Moderate	42.3%	234
Conservative	28.0%	155

**Note*. Percentages may not equal 100 because of rounding.
[a]*Note*. Political Ideology (1 = extreme liberal, 4 = moderate, 7 = extreme conservative).

Fig. 1. Hypothetical OWD Project Photo Simulation. **Note*: The hypothetical photo simulation image was prepared as part of a US Bureau of Ocean Energy Management (BOEM)-funded project to evaluate the effects of offshore wind turbines on beach tourism [33,58]. The image was prepared by Nik Hennessy/Macro Works, Ltd, leading consultants specializing in landscape and visual impact assessments.

Table 2
New Hampshire Coastal Recreationists' Trip Visitation Characteristics.

Variable	% or Mean	*n*
Primary Activity Type		
Commercial charter fishing operation	12.7%	70
Commercial tour boat operation	12.5%	69
Non-motorized pleasure boating	11.9%	66
Motorized pleasure boating	11.4%	63
Beach activities	9.9%	55
Fishing from shore	9.4%	52
Fishing from a private boat	9.2%	51
Land activities	9.0%	50
Water activities	6.1%	34
Surfing	5.6%	31
Other activities	2.1%	12
Repeat versus First Time		
Repeat visitor	98.2%	543
First time visitor	1.8%	10
Residency Status		
New Hampshire Resident	75.0%	525
Experience Use History		
Average days per month recreating	7.5 days	489
Average days per year recreating	48.0 days	505
Average total years recreating	26.3 years	529
Distance Traveled from Home		
Median distance traveled	30.0 miles	529
Visitors traveling 50 miles or less	78.3%	414

*Note. Percentages may not equal 100 because of rounding.

fishing operations and commercial tour boat operations (e.g., whale watching tours) each represented approximately 13%, followed closely by non-motorized pleasure boating (e.g., sailing) (12%), motorized pleasure boating (11%), and beach activities (10%). Regarding trip visitation characteristics, the vast majority of respondents were repeat recreationists (98%) and New Hampshire residents (75%) who noted traveling a median distance of 30 miles from their homes to the coastal recreation survey site. These largely local and highly experienced coastal recreationists noted visiting the New Hampshire seacoast an average of: eight days per month, 48 days per year, and 26 years. These sociodemographic and trip characteristic findings are similar to other research in the study area [60,61]. However, it should be noted that while respondents are largely representative of New Hampshire residents, they are more educated (e.g., 54% four-year college degree or higher) than the larger New Hampshire population (e.g., 37% four-year college degree or higher) [61].

To assess coastal recreationists' general attitudes towards OWD at the New Hampshire seacoast, respondents evaluated three separate, yet inter-related, single-item seven-point Likert scales: 1) OWD acceptance, 2) OWD support, and 3) OWD landscape fit (Table 3). The first item assessed respondents' acceptance towards OWD at the New Hampshire seacoast on a seven-point Likert scale (1 = very unacceptable, 7 = very acceptable). The second item evaluated respondents' support and opposition towards OWD at the New Hampshire seacoast on a seven-point Likert scale (1 = strongly oppose, 7 = strongly support). The third item assessed respondents' perceptions of the 'fit' of OWD within the New Hampshire seascape on a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree). These three survey questions were in the vein of general acceptance of OWD rather than specific acceptance of a proposed project in a particular location, at a given distance, with a specific installed capacity, and/or expected generation. Overall, coastal recreationists were largely accepting (M = 5.19) and supportive (M = 5.22) of OWD at the New Hampshire seacoast. Moreover, the majority of respondents agreed that OWD would fit the seascape (M = 4.56) at the New Hampshire seacoast. All three of these constructs have been previously validated to assess visitors' attitudes towards energy development [4,20,25,27,28,57,62-64].

To measure coastal recreationists' perceived impacts of OWD upon recreation, respondents evaluated the extent OWD would negatively or positively impact their overall coastal recreation experience at the New

Table 3
New Hampshire Coastal Recreationists' Attitudes, Perceptions and Coping Behaviors towards OWD.

Variable	*Item M (SD)*	*Scale M (SD)*
General OWD Attitudes		
OWD Acceptance[a]	5.19 (1.61)	4.98 (1.52)
OWD Support[b]	5.22 (1.59)	
OWD Landscape Fit[c]	4.56 (1.77)	
Recreation Impact		
Perceived Recreation Impact[d]	4.36 (1.64)	—
Coping Behaviors		
Avoidance[e]		
Avoid recreating around OWD	2.61 (1.88)	2.54 (1.77)
Avoid certain areas of the NH coast	2.49 (1.80)	
Resource Substitution[e]		
Recreate at a different location *outside* the NH coast	2.31 (1.67)	2.44 (1.63)
Visit a different area of the NH coast	2.31 (1.67)	
Activity Substitution[e]		
Change my recreation activity	2.42 (1.70)	2.40 (1.65)
Participate in some other recreation activity	2.38 (1.68)	
Displacement[e]		
Abandon my recreation experience altogether	1.74 (1.32)	1.65 (1.20)
Never visit the NH coast again	1.57 (1.22)	

*Note. *n* = 533 for all variables in Table 3.
[a]*Note*. NH OWD Acceptance (1 = very unacceptable, 7 = very acceptable).
[b]*Note*. NH OWD Support and Opposition (1 = strongly oppose, 7 = strongly support).
[c]*Note*. NH OWD Landscape Fit (1 = strongly disagree, 7 = strongly agree).
[d]*Note*. NH OWD Recreation Impact (1 = negatively impacted, 7 = positively impacted).
[e]*Note*. NH OWD Coping Behaviors (1 = completely disagree, 7 = completely agree).

Hampshire seacoast (Table 3). This was performed through the use of a single-item seven-point Likert scale (1 = negatively impacted, 7 = positively impacted). Overall, respondents noted their recreation experience would be slightly positively impacted (M = 4.26) by OWD at the New Hampshire seacoast. This construct was created based on previously validated OWD and recreation impact literature and conversations with natural resource managers [4,28,57,65].

Finally, to assess coping behaviors, coastal recreationists were asked to indicate the extent to which eight coping items would describe their response to OWD at the New Hampshire seacoast (Table 3). Respondents rated these eight coping items using a seven-point Likert scale (1 = completely disagree, 7 = completely agree). These eight coping items represented four unique behavioral coping domains: 1) activity substitution, 2) resource substitution, 3) avoidance, and 4) displacement, each behavior was measured with two items. Respondents largely disagreed that the presence of OWD within the New Hampshire seacoast would cause them to employ coping behaviors, with means scores ranging from 2.61 to 1.57. The highest rated coping domain was avoidance (M = 2.54), followed closely by resource substitution (M = 2.44) and activity substitution (M = 2.40). The coping domain that received the lowest mean rating was displacement (M = 1.65). This multi-item coping construct has been previously validated to assess visitors' employment of coping behaviors in recreation settings [47,48,66].

4.2. Structural equation model for attitudes toward offshore wind energy development

SEM was used to examine the relationships between perceived recreation impact, coping behaviors, and general OWD attitudes. SEMs are particularly useful in their ability to model structural regression pathways between latent variables generated via confirmatory factor analyses (CFAs). The first latent variable included in the SEM, 'coping index', was generated from a CFA of eight measured items that operationalize four domains of coping behaviors: 1) activity substitution, 2) resource substitution, 3) avoidance, and 4) displacement; each behavior was measured with two items. Because the eight measured items

represented four domains of coping behaviors, error covariances were included between the two items in each sub-set. A measurement model for coping behaviors was established via a CFA (Table 4). The initial measurement model did not show an acceptable fit to the data. After reviewing the modification indices, the two coping behavior items related to the displacement domain were removed, at which point the model demonstrated an acceptable fit to the data and the coping index construct showed sufficient reliability and fit ($a = 0.95$). It is important to note that these two displacement items represented rather extreme forms of behavioral coping; therefore, the theory of stress-coping in addition to the modification indices informed this decision.

To robustly operationalize the second latent variable, 'general OWD attitudes index', a latent dependent variable was generated from three single-item survey measures: 1) OWD acceptance, 2) OWD support, and 3) OWD landscape fit. Due to OWD along the New Hampshire seacoast still being hypothetical, it is reasonable to assume that all three measured constructs are sub-components of general OWD attitudes at the New Hampshire seacoast. A measurement model for general OWD attitudes was established via a CFA (Table 4) and the construct showed sufficient reliability and fit ($a = 0.91$). Finally, a dichotomous condition of whether respondents were presented with a photo simulation of a hypothetical OWD project, or not, was included as a stratification variable in the SEM, to account for the non-independence of the observations (between respondents in the photo group and non-photo group) [67]. It is worth noting that initial analyses tested for various other interactions (e.g., activity type, demographics, residency location, in-state vs out-of-state, place attachment, experience use history), but no significant relationships were found.

The SEM model is displayed in Fig. 2. The SEM revealed a good fit to the data across the key indices (χ^2:122.1; $df = 30$; $p < .001$; CFI = 0.96; TLI = 0.95; RMSEA = 0.07; SRMR = 0.04) [68]. All parameter estimates are standardized estimates and have p-values < 0.001. Latent variables are represented by ovals, with arrows extending from them to the component items (with factor loadings listed). Measured variables are represented by rectangles. Arrows from measured to latent variables or between latent variables represent structural regression pathways (with beta coefficients listed). Lines with arrows at both ends represent error covariances. The effect size (R^2 value) for each of the dependent variables are also presented.

Overall, SEM results indicated that together, perceptions of recreation impact and coping behaviors explained three-fifths (60%) of the variance in general OWD attitudes at the New Hampshire seacoast. Perceived recreation impact from OWD had a direct effect on general OWD attitudes, but also an indirect effect mediated through coping behaviors, as expected. Support for, acceptance of, and perceived landscape fit of OWD along the New Hampshire seacoast increased substantially as perceptions of recreation impact became more positive. Moreover, positive perceptions of recreation impact diminished the need to initiate coping behaviors, with an expressed intention to undertake such behaviors fostering less support for, acceptance of, and perceived landscape fit of OWD. Thus, coping behaviors partially mediated the relationship between perceived recreation impact and general OWD attitudes at the New Hampshire seacoast.

Table 4
Confirmatory Factor Analysis of Coping Behaviors and General OWD Attitudes[a].

Variable Code[b]	*Loading*[c]	*M (SD)*
Coping Index[d] ($a = 0.95$)		
Activity Substitution 1	0.84	2.42 (1.70)
Activity Substitution 2	0.85	2.38 (1.68)
Resource Substitution 1	0.92	2.31 (1.67)
Resource Substitution 2	0.92	2.59 (1.82)
Avoidance 1	0.84	2.61 (1.88)
Avoidance 2	0.84	2.49 (1.80)
Items removed from CFA measurement model		
Displacement 1	—	1.74 (1.32)
Displacement 2	—	1.57 (1.22)
General OWD Attitudes Index[e] ($a = 0.91$)		
OWD Acceptance[e]	0.87	5.19 (1.61)
OWD Support[f]	0.94	5.22 (1.60)
OWD Landscape Fit[g]	0.84	4.56 (1.77)

[a]*Note*: χ^2:122.1; $df = 30$; $p < .001$; CFI = 0.96; TLI = 0.95; RMSEA = 0.07; SRMR = 0.04.
[b]*Note*: Variable code refers to SEM model, see Fig. 2.
[c]*Note*: Standardized factor loading. All loadings were significant at $p < .001$.
[d]*Note*. Coping Index (1 = completely disagree, 7 = completely agree).
[e]*Note*. NH OWD Acceptance (1 = very unacceptable, 7 = very acceptable).
[f]*Note*. NH OWD Support and Opposition (1 = strongly oppose, 7 = strongly support).
[g]*Note*. NH OWD Landscape Fit (1 = strongly disagree, 7 = strongly agree).

5. Discussion

United States OWD is poised to expand significantly in the coming decade as a result of substantial wind resources adjacent to large population and coastal load centers [6]. A significant portion of OWD infrastructure may be sited within or proximate to parks and protected areas, used extensively for coastal recreation. This study examined the influence of perceived recreation impact and coping behaviors upon coastal recreationists' general attitudes towards potential OWD at the New Hampshire seacoast. The experienced, local, and politically moderate sample were largely supportive and accepting of OWD and agreed that OWD would likely 'fit' the seascape (i.e., research question R^1). Study findings support the broader literature which suggests attitudes towards OWD in the United States have generally trended towards acceptance and support [4,7,12,14].

Respondents largely disagreed that the situational factor of OWD would cause them to significantly alter their recreation behaviors, activities, or experiences (i.e., research question R^2). Rather, the overall sample indicated that OWD would likely have a positive impact upon the overall coastal recreation experience. For example, study findings and previous research suggest OWD may represent novel recreation attractions that could present new opportunities for coastal recreation such as sightseeing and informational and interpretive boat tours to visit and view OWD sites [4,11,31,33]. Further, OWD foundations have been shown to act as artificial habitats and structures for marine life, increasing angler catch rates and providing scuba diving opportunities [39,41,42,69]. Anglers and divers often target structures in open bodies of water, as marine life populations may congregate and thrive around the cover they provide. These findings have intuitive appeal as research suggests coastal recreationists may be predisposed to support renewable forms of energy development such as OWD [4,25,70].

Study findings indicated that perceived recreation impact was a more robust predictor of general OWD attitudes as opposed to coping behaviors. In other words, while behavioral adaptations were significant, they were not as powerful as recreation impact in the prediction of general OWD attitudes adjacent to parks and protected areas. These findings validate the importance of this research, demonstrating the value of including perceived recreation impact in energy development research and decision making [4,27,57]. Moreover, this research found that the influencing factor of perceived recreation impact as well as coping behaviors had a significant effect upon general attitudes towards OWD (i.e., research question R^3). The relationship between perceived recreation impact and general attitudes towards OWD was partially mediated by coping behaviors. While these concepts have been suggested, to our knowledge, this is the first study to empirically validate these notions amongst a coastal recreation population.

In terms of theory, inferences were drawn between study findings and the theories of stress-coping and landscape fit. For example, study findings offered parallels for the theory of stress-coping. While recreationists have been shown to employ various coping behaviors in efforts to mitigate negative, undesirable, or stressful social conditions, to our knowledge, this is the first study to apply a modified stress-coping framework within the context of coastal recreation and energy

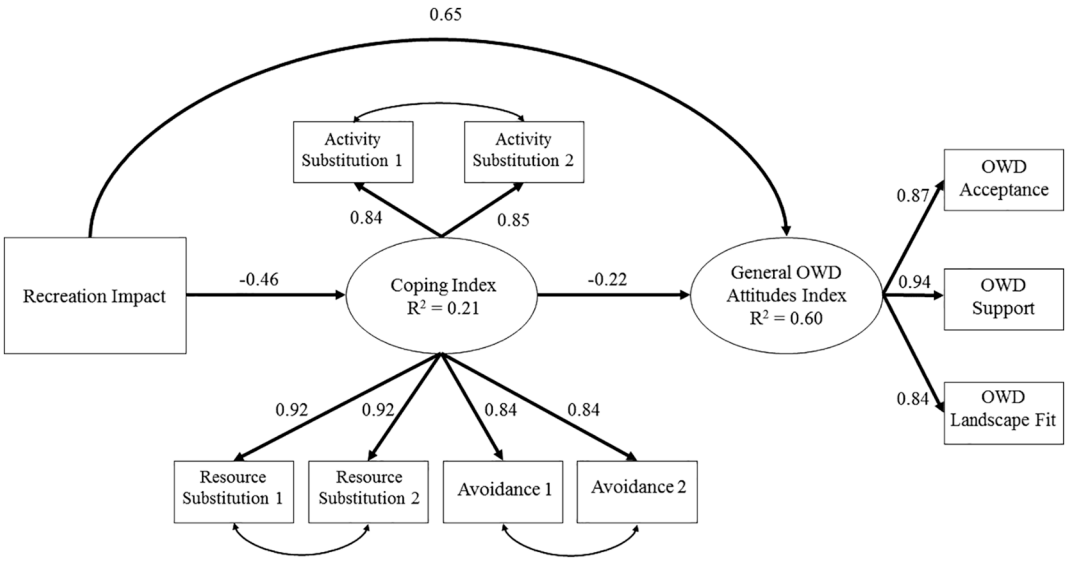

Fig. 2. SEM Model[a]. [a]*Note*: χ^2:122.1; *df* = 30; p < .001; CFI = 0.96; TLI = 0.95; RMSEA = 0.07; SRMR = 0.04. [b]*Note*: All relationships were significant at p < .001, except for the error covariance between the two variables labelled *Resource Substitution 1* and *Resource Substitution 2*, which was p = 0.007.

development. The findings in this study were unique in that respondents perceived energy development would *positively* influence their coastal recreation experience. As such, general attitudes towards OWD increased substantially as perceptions of recreation impact became more positive. As to be expected, the more recreationists identified OWD as a positive impact on their overall experience, their need to employ coping behaviors diminished. Thus, it seems that beliefs about the impact of OWD upon coastal recreation may have positively influenced the stress of the seascape change. As such, the more visitors found the need to employ coping behaviors, general attitudes towards OWD decreased. These findings are intuitive as coping behaviors likely are not necessary when influencing factors (e.g., beliefs) are perceived positively, thus eliminating distress from the situation. The paths between latent variables revealed patterns generally consistent with previous coping models [45-48] and served to expand and diversify the coping literature to include energy development applications.

Study results also expanded upon the theory of landscape fit and suggest coastal recreationists may consider OWD to be consistent with their perception of the landscape, community, and experience [4,15,20]. Respondents attitudes towards the acceptance, support, fit, and recreation impact of OWD was generally positive. Moreover, the lack of photo-elicitation priming found in this study suggests viewshed impacts and the spatial proximity of OWD siting did not have a significant influence upon general attitudes towards OWD. In this study, the hypothetical photo simulation depicted an OWD project located 10 miles from shore. Study findings support the literature which suggests that as the distance of OWD siting from shore increases, coastal recreationists' general attitudes towards OWD becomes more positive [17,21]. When assessing general attitudes towards OWD, it appeared that coastal recreationists in this study perceived an enhancement to their experience rather than a disruption, regardless if they viewed the photo simulation or not. However, these novel findings also suggest that viewing (or not viewing) an OWD project has little to no significant influence upon general attitudes towards OWD. Thus, OWD 'fit' in this study context can be viewed as a measure of continuity, which has been demonstrated to be a core component of general OWD attitudes [4,28].

This study also has potential to inform natural resource management and policy. While the OWD industry is beginning to build the foundations of a powerful economic segment, the coastal recreation industry has long established itself as an essential sector of the United States economy [9]. Across the nation, beaches and their associated coastal recreation activities serve as the leading source of tourism revenues in states with coastlines [31,71]. For instance, in 2016 coastal recreation in the United States generated more than $124 billion in gross domestic product and employed more than 2.4 million people [72]. Accordingly, many coastal communities proximate to OWD sites have grown dependent upon the coastal recreation economy.

Moreover, the intersection between coastal recreation, energy development, and public policy in the United States is timely as the landmark *Great American Outdoors Act* was recently signed into law on August 4, 2020 [73]. Among other things, the Great American Outdoors Act requires 50% of all energy development revenues due and payable to the United States from renewable and non-renewable energy development on Federal lands and waters, to be deposited into the Public Lands Legacy Restoration Fund to address the deferred maintenance backlog in various federally managed parks and protected areas [73]. Thus, the Great American Outdoors Act may provide a conduit to further a symbiotic relationship between the coastal recreationists, the adjacent coastal communities, OWD industry, and parks and protected areas in the United States.

The influence of the incoming OWD boom upon coastal recreation represents a unique scenario for natural resource managers and coastal communities. The primary challenge revolves around managing public lands and waters to provide simultaneous opportunities for high quality recreation experiences as well as OWD expansion. In this study, respondents largely agreed that the presence of OWD would not cause them to substitute their recreation activities, their recreation resources, or be displaced from their recreation experiences. These findings call into question the conventional assumption that OWD presents a negative and/or stress inducing experience for coastal recreationists. Rather, study findings suggest the presence of OWD may positively affect the coastal recreation experience and will likely have little impact on aggregate visitation, and in some instances, may even amplify coastal recreation visitation. Natural resource managers and the OWD industry should work collaboratively with coastal recreationists in a simultaneous effort to increase transparency and reduce negative perceptions towards the OWD process.

The authors also suggest additional possible explanations for the overall positive attitudes towards OWD amongst coastal recreationists found in this study. The prospect of this novel form of energy development may be perceived as intriguing and exciting for the largely local, experienced, educated, and political moderate study sample. This concept of excitement towards OWD amongst recreationists garners intuitive appeal as coastal recreationists have been demonstrated to be

predisposed to support OWD, even across the political spectrum [4,25,70]. This notion is particularly relevant amongst the local and experienced sample, who may benefit from new recreation opportunities such as sightseeing, increasing angler catch rates, scuba diving, and an overall boost to the recreation economy, as seen in similar studies [4,18,19,31,32,32,38-43]. Moreover, the local nature of the study sample may be more likely to positively perceive the various tangible (e.g., jobs, electricity cost, air quality) and intangible (e.g., community pride, energy independence) benefits that OWD often provides local areas and the overall social-ecological system [17]. Study findings suggest the importance of understanding local context and embracing local impacts for OWD to be successful with specific populations and in specific settings.

Implications for future research include examining the perceived recreation impacts of OWD across multi-item constructs, segmenting coastal recreationists, investigating the influence of other various outside factors, and employing assessments of both proposed and actual OWD sites. This study employed a single-item indicator to measure coastal recreationists' perceived recreation impact of OWD. This single-item indicator was successful, but future research should consider including other multi-item recreation impact measures with various unidirectional scaling along with this variable in an effort to corroborate study findings. While the focus of the study was to assess coastal recreationists, there is merit in examining differential effects among both the larger population as a whole as well as the influence upon individual coastal recreation activities. While study respondents were largely representative of New Hampshire residents (albeit, more educated), given that New Hampshire is relatively homogenous by race/ethnicity, we cannot say that the results are necessarily reflective of Spanish/Hispanic/Latino, African American, and Asian populations. Future studies in coastal states that are more racially diverse would be beneficial. Future studies should consider segmenting and analyzing coastal recreationists by land vs. water activities and by well-defined activity types. These segmentations and analyses could aid in further understanding general attitudes towards OWD. Additionally, it is plausible that other factors, outside of recreation impact and coping behaviors, may significantly influence coastal recreationists overall attitudes towards OWD. It should be noted that this study did indeed test for various relationships (e.g., activity type, demographics, residency location, in-state vs out-of-state, place attachment, experience use history), but no significant relationships were found. Future research should consider investigating the influence of factors such as perceptions towards climate change, renewable energy in general, and the local economy upon overall attitudes towards OWD within a coastal recreation context. Future studies should also consider collecting non-response data from visitors who are unwilling or unable to respond to the survey, as non-response bias is possible when collecting on-site surveys. Finally, future research should consider assessing both proposed and actual OWD sites in an effort to further investigate potential similarities and differences between visitor' perceptions of hypothetical and real OWD installations.

6. Conclusions

The results of this study suggest positive perceptions and attitudes towards the situational factor of OWD at the New Hampshire seacoast among coastal recreationists. Respondents largely agreed that OWD would not cause them to alter or substitute their recreation activities, behaviors, or experiences. Based on these findings, it may be that OWD will have little impact on aggregate coastal recreation visitation, and in some instances, OWD may even amplify visitation. Perceived recreation impact was demonstrated to be a powerful variable in the model and exceeded coping behaviors in predicting general attitudes towards OWD within or adjacent to parks and protected areas. Given that coastal recreation is an essential sector of the United States economy, policy-makers, natural resource managers, and the OWD industry should recognize coastal recreationists as critical stakeholders within the OWD realm. This recognition is crucial as the United State OWD boom commences and OWD companies attempt to gain public support. Engagement and communication with coastal recreation stakeholders will be essential to the continued success of OWD in the United States. This study corroborates and expands upon previous energy development research and emphasizes the importance of evaluating coastal recreationists' perceptions, behaviors, and attitudes from a social-ecological perspective when initiating OWD projects in the United States and around the world.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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