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Place meaning and consistency with offshore wind: An island and coastal tale

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ABSTRACT

This work continues a series of analyses using surveys of local communities regarding the Block Island Offshore Wind Project. Data collection focused on island and coastal resident attitudes toward the project and cognitions of the coastal setting. We report results from the first and final surveys. Multivariate statistical analysis was used to evaluate relationships among variables. Results indicate that attitudes about the project have solidified as more people have seen it. A majority support the project, and a small percent consider the project inconsistent with specific meanings associated with the ocean environment. These meanings stand out amongst other place constructs. Furthermore, the relationship among turbine descriptions and place meanings and their consistency with the project as a use of the ocean, along with general support for the project is explored. The results continue to validate a place-based understanding of the responses of people to a changing energy landscape.

1. Introduction

During the past few decades, onshore wind has seen large expansions in the U.S.; however, offshore development has lagged significantly behind Europe. Now that the U.S. offshore market appears to be taking off, attention from researchers can shift accordingly. Although offshore winds are typically stronger and more stable than their land-based counterparts, existing infrastructure, shipping and fishing industries, as well as community perceptions are potentially important limiting factors.

As of 2020, the Block Island Offshore Wind Project (BIOWP) endures as America's only operational offshore wind energy installation. As such, it remains a point of insight into factors facing an industry poised to move ahead. The policy window has not been better than in recent years despite the uncertain future of the Production Tax Credit (PTC) for renewables. The U.S. eastern seaboard remains the likeliest location for utility scale offshore wind in the near-term. This status has been earned due to high energy prices, dense populations with large energy demands, high wind speeds, shallow waters, and state policy support. Despite the possibility of phasing out the PTC, diffusion of offshore wind supportive policies has proliferated in U.S. states This can be seen in the recent announcements of procurements by Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Maryland as well as large new leases announced in late 2018.

Here, the research team explores the social elements of offshore wind siting in the U.S. through the BIOWP, which continues to be an important case study [1–4]. It builds upon the research reported by Firestone et al. [2]. Measures such as support/opposition and turbine descriptions from the first two of three longitudinal surveys used in that research were updated here with data from the third survey. As well, other aspects such as place meaning and whether the BIOWP is consistent with those meanings were developed anew.

1.1. Study setting

Block Island, Rhode Island sits 26 km across Block Island Sound from the mainland's nearest point—Point Judith. It is also 23 km from the tip of Long Island and approximately 69 km west of Martha's Vineyard (Fig. 1). The Island itself is approximately 25 km^2 consisting mostly of low-lying natural spaces and fresh-water lakes which are protected from development. There are approximately 1000 permanent residents; however, this population can swell to 20,000 people during the summer

Abbreviations: BIOWP, Block Island Offshore Wind Project; PTC, Production Tax Credit; NIMBY, Not in My Back Yard; BI, Block Island; RI, Rhode Island.

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tourism season. Almost 50% of the island is protected space and the island is regularly marketed on its natural attractions. Similarly, the Rhode Island coastal communities near the project are a mix of permanent and seasonal housing, with a varied coastline featuring state and local beaches, salt ponds, and some low-lying commercial development (e.g., restaurants and marinas).

On the island's southeastern coast, the Mohegan Bluffs rise over 60 meters above the sea. As of 2016, they look out over an ocean inhabited by five wind turbines, which make up the BIOWP. The turbines were installed approximately 5 km from shore, significantly closer than the 20 GW of planned generation along the eastern U.S. The BIOWP's proximity to the island is a result of a desire to develop within state waters, which extend only 5.6 km from shore and an intensive state planning process.

Project foundation construction began in mid-2015. Two underwater transmission cables were laid and the turbines installed during the summer of 2016. One cable connects the BIOWP to Block Island and the other connects the Island to the mainland grid near Narragansett. The project commenced operations in December of 2016, however, electricity was only transmitted to the mainland until on-Island transmission began in May of 2017. Previously, Block Island relied exclusively on local diesel generators. The island is now connected to both the BIOWP and the mainland power grid.

2. Materials and methods

The sample frame is comprised of inhabitants of Block Island (stratum 1) and of census units (Fig. 1) bordering the ocean (stratum 2) and

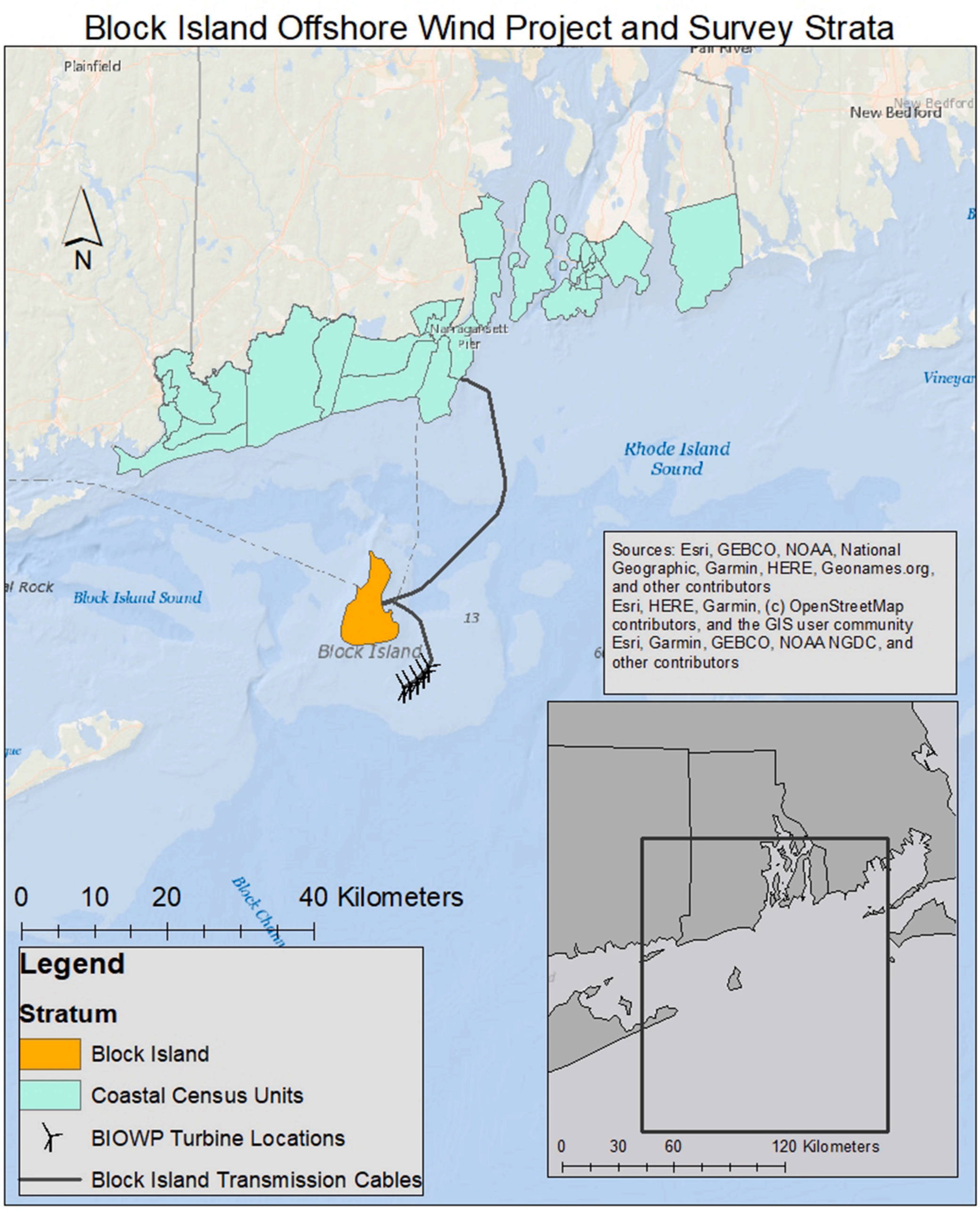

Fig. 1. Map of Block Island Offshore Wind Project with associated turbines and undersea transmission cables.

then those units (stratum 3) that are adjacent to stratum 2. These were chosen as the focus given their connection to the ocean and because community members may feel the effects of the project [5]. All households on Block Island and a random sample of strata 2 and 3 households were sampled. The number of observations from each stratum are given in Table 1.

For the first survey, respondents were given the option of completing a mail survey or internet survey employing Qualtrics software. Given the longitudinal design, for subsequent surveys, participants were provided the same survey mode – either internet or mail – as they had completed before. Recruitment generally followed procedures laid out by Dillman et al. [6] and included an incentive (a chance at a drawing for a $500 gift card on the first two surveys and a $5 thank you payment for past and current help on the third) as well as postcard reminders. The materials and methods necessarily do not deviate from those reported in Firestone et al. [2].

The first survey, undertaken after foundation installation but before turbine erection, saw 672 responses for an effective rate of 33%. The second survey, which commenced just after project commissioning, garnered 420 valid responses.[1] For the third survey, initiated one year later, the 672 individuals who responded to the first survey were contacted. After excluding observations where it was determined the same individual did not answer the first and third survey based on a demographic comparison (e.g., age, gender, education), responses from survey respondents who answered the first and third surveys (n = 420; overall response rate = 20%) are reported. Strata 2 and 3 responses are combined into a Coastal RI sample for the purposes of the analysis and for reasons of parsimony. Descriptive statistics are weighted by age, gender, education, and stratum.

3. Literature review

One critical role of communities in wind energy siting is the provision of acceptance as community opposition can be one of the greatest obstacles to these projects [7]. Renewables projects can face local resistance despite being supported generally [8,9], however, the veracity and composition of such opposition is contextual [10]. Pasqualetti [11] notes five common threads of opposition: immobility; immutability; solidarity; imposition; and place identity. This is in contrast to the simplistic theorizing of NIMBY (Not In My Back Yard) responses as explanations for this resistance [12–14].

Social acceptance is an oft-used frame despite being an imperfect term due to the connotation of acceptance as passive tolerance for the project or technology versus active support [15]. The topic has garnered a large amount of attention over the past three decades [7,12,16]. Even when renewable energy projects are supported from the top down as through socio-technical imaginaries, acceptance and justice at the community level can become problematic [8]. Batel & Devine-Wright [17] and Wolsink [18] recognize the importance of including attention to communities that cannot see the turbines directly, but that can still feel effects, such as changes to electricity prices or cherished vacation spots.

Table 1
Survey strata.

Stratum	n	Percent	Cum. percent
1. Block Island	111	26.4	26.4
2. Border Ocean	171	40.8	67.1
3. Near Ocean	138	32.9	100.0
Total	420	100	

The corpus of literature regarding multiple aspects of energy development continues to mature, and work devoted to social and policy aspects of offshore wind siting is no exception. Due to "dynamic visual qualities", wind turbines' effect on the landscape is one of their more often perceived elements [19]. Notably, they have been seen as out of scale and out of place or even "weed-like" [20]. Given this, a great deal of research has examined the interactions of wind turbines with landscapes [19,21–23]. It is within this framework that Wolsink [18] explains that the effect of a wind project is not merely an assessment of the infrastructure, but of change in landscape quality.

Beyond representing a change to the landscape – often replacing already 'invisible' sources of electricity [24] or developing something where nothing of the sort has existed before – renewables suffer from issues of scale. Pasqualetti notes "whatever we do to make wind turbines less conspicuous, we can do nothing to make them invisible" [11, p. 908]. Even when energy systems are to be installed in spaces often referred to discursively as 'wasted,' as with deserts, challenges abound [25]. In contrast to such spaces, the coasts are more heavily peopled and thus may present even greater social challenges [26]. Perhaps the specialness inherent in the ocean as a place of human/nature interaction is at the core of such a challenge [1,27].

Additional insight into the intricacies of perception are provided by a range of place-based constructs including attachment, identity and dependency, which can engender place protective behavior [7,14]. Within these are emotional, functional, and social components [28,29], which together form an overarching "sense of place" [5]. More recent work has focused upon whether renewable energy transitions are place consistent [23] and how they are judged at even the individual level against specific place meanings [30,31]. Additional insights can be gleaned from studies on potential projects. Kempton et al. [27] explored some of the landscape-based objections to a proposed and now cancelled project off Cape Cod, Massachusetts, finding that people give special significance to the ocean there and desire to avoid intruding upon it. Devine-Wright and Howes [32] explain that place-related responses, need not always indicate disruptions. Bates and Firestone [33] apply this logic to studies of community responses to proposed offshore projects in two states, New Jersey and Delaware, finding no definitive relationship between place attachment and project support. Therefore, another dynamic element may be at play. Firestone et al. [2] state that this may be a question of whether a project is "in- or out-of place," as earlier suggested by Cowell [34].

An important aspect of the third survey was the inclusion of questions regarding place meaning. Devine-Wright [35] mentions place meaning in the context of place-attachment and proposed tidal power installations. These symbolic meanings are interpreted as "cognitions and/or evaluative beliefs concerning a setting that reflect the value and significance of the setting" by Wynveen et al. [31] from Stedman [30]. As well, there may be socially constructed symbolic meanings associated with a proposed project in addition to the places it might affect [32]. Some work has been done using the concept of place meanings as a lens through which development/environment interactions can be viewed. For example, Jacquet and Stedman [36] utilize place meanings as an element of their multivariate statistical analysis of wind and natural gas developments and Brehm et al. [37] analyze place meanings in the context of watershed management practices.

Our prior work and the aforementioned considerations led us to pose two research questions:

o Which place meanings are associated with the ocean and coastal environment for near-ocean Rhode Islanders and Block Island residents?

[1] Surveys two and three both originally had differing numbers of respondents. After checking for consistency among survey iterations based on demographic information, we removed respondents in subsequent surveys who appeared not to have answered the first survey (E.g., a different member of the household despite the survey being addressed to a specific individual).

o Is there a significant explanatory power in place meaning and consistency/inconsistency with the BIOWP and overall support/opposition to it?

4. Descriptive statistics

Here, descriptive statistics are provided for relevant variables from survey three. In all cases, Block Island and coastal Rhode Island populations are compared. Survey weighting is used in most cases; however, unweighted data is used in cases where counts are reported instead of proportions due to small observation numbers. T-tests and chi-square tests are used to determine statistical significance where applicable.

4.1. Seeing the project and support or opposition

Unsurprisingly, all Block Island residents have now seen the project, but only slightly more than half of coastal respondents had at the time of the third survey.[2] Whether coastal residents had seen the turbines is controlled for in regression analyses. Table 2 provides results on support and opposition by stratum in the first and third surveys. The project support variable is a 5-category composite of responses to two questions. First, does the respondent support or oppose the project, or have they not made up their mind? If they have not made up their mind, respondents answer a subsequent question about whether they are leaning one way or another. Non-response to the leaning question is considered to be a neutral answer.

The longitudinal data on support and opposition displays a clear difference between the island and coastal populations and high support overall. In coastal Rhode Island, there is a shift from leaning support (pre-installation) to support (post-operation). In contrast, on Block Island, the largest shift from pre-installation to post-operation is from opposition, neutral and leaning support to support. There is a statistically significant difference between pre-installation and post-operation support for both populations when using a paired *t*-test, but not a significant difference between the means when comparing the island and coast directly. Additionally, a variable for change in support did not show significant correlation with our primary variable of interest, place meaning consistency.

Table 2
Support and opposition proportion change from Surveys 1 and 3.

Stratum	Block Island		Coastal RI	
N	107		292	
	Pre-installation	One-year after operation	Pre-installation	One-year after operation
Oppose	19%	11%	9%	6%
Lean Oppose	1%	2%	1%	4%
Neutral	2%	1%	2%	1%
Lean Support	10%	4%	20%	12%
Support	68%	82%	68%	77%
Mean (1–5)	4.11	4.47	4.38	4.49
Mean Difference	p = 0.004		p = 0.023	

Table 3
Comparison of landscape fit of the turbines by location.

		Agree	Neither agree nor disagree	Disagree	Mean (1–3)
Block Island	Day Fit N = 107	64%	13%	23%	2.41
	Night Fit N = 98	46%	28%	26%	2.2
Paired T-test for day to night difference					p = 0.02**
Rhode Island Coast	Day Fit N = 277	46%	34%	20%	2.26
	Night Fit N = 229	39%	45%	16%	2.23
Paired T-test for day to night difference					p = 0.16

4.2. Project fit

In the third survey, participants (both those who had seen the wind turbines and those who had not) were asked to respond to questions regarding the BIOWP's 'fit' within the landscape/seascape. The data is presented (Table 3) combining 'agree' and 'somewhat agree' and 'disagree' and 'somewhat disagree' (3) and retaining "neither".

After a year living beside operating turbines, a greater percentage of Block Islanders think the turbines fit well with the landscape during daylight (64%) than coastal residents (46%). The results also show similar percentages (23% and 20%) in disagreement with the same statement. Answering 'neither' was more than twice as likely on the coast as on the island (34%–13%). The data shapes up in a similar way regarding fit at night. The major differences are that agreement is lower than for daylight fit and both populations answered with 'neither' in higher percentages (30% and 45%). A paired T-test was used to evaluate whether the difference in the means between day and night was significant. The results indicate a significant difference at the 95% confidence level for islanders (greater average fit during the day than night), but not for coastal residents. A chi-square test was used to compare proportions between both populations. There were significantly higher ratings of daytime fit among islanders than coastal residents ($p = 0.01$), but no differences between the populations in terms of nighttime fit ($p = 0.08$).

4.3. Turbine descriptions and place meaning consistency

Answers to survey questions regarding turbine appearance and place meaning are reported in Table 4. For turbine appearance, respondents were asked "specifically, would you describe the wind turbines as…", and given 12 possible descriptions and 'other,' where they could provide a description of their own. Respondents were asked to select "all that apply." Results are subdivided by location and whether respondents on the coast had seen the turbines. The description of the wind turbines that resonated most universally among both BI (80%) and coastal RI residents (77% if seen, and 81% if not seen), was *symbolic of progress towards clean energy*. The second most resonant description was *impressive* (76% on BI vs 54% and 45% on the coast). Importantly, although a minority in each instance, some respondents find that the project has resulted in *an intangible loss where all you can see is the ocean* while others find it *detracts from the island/coastal character*. This proportion is notably higher for those who report having seen the project than for those who do not, and the difference is statistically significant for intangible loss ($p = 0.03$).

[2] Those who have not seen the wind turbines either (a) tried to see them and they were not visible at the times they tried, or they did not try. They are not visible from the coast at many times under lighting conditions. We believe it is likely that almost all respondents, each of whom lives within a few miles of the coast would have taken/had the opportunity to attempt to see the wind turbines between the time they were installed (Aug 2016) and the time they responded to the third survey (early 2018). We note as well that in the third survey 25 individuals when asked if the wind turbines fit the landscape during the day or night selected "not applicable" for both. We think it likely that all other individuals had opportunity to observe the wind turbines.

Table 4
Description of the wind turbines (survey 3), ordered by RI coastal opponents who had not yet seen the wind turbines.

Description	BI	Coastal RI Seen	Coastal RI Not Seen
	N = 109	N = 164	N = 126
Symbolic of progress towards clean energy	80%	77%	81%
Impressive	76%	54%	45%
Industrial	20%	17%	23%
Adding to the island/coastal character	25%	12%	19%
Amazing	27%	29%	14%
Detracting from the island/ coastal character	18%	20%	10%
Unattractive	15%	13%	9%
Cause the loss of something intangible, where all you see is the ocean	26%	21%	8%
Beautiful	19%	7%	7%
Too Big	16%	8%	7%
Other	5%	5%	5%
Ordinary	7%	5%	4%
Attractive	25%	20%	2%

Furthermore, when broken down by support/opposition[3] (Appendix A), results indicate that supporters and opponents chose these descriptions as well as *unattractive* more than other negative descriptions. This indicates that offshore wind is not without disamenities [38] and negative effects on sense of place even for supporters. Likewise, some islanders and coastal residents who opposed the project nevertheless described it as *impressive* or *symbolic of progress towards clean energy*.

Respondents were also provided with twelve place meanings developed from the literature regarding place meanings in marine settings [31]. As a component, the construct related to economic uses of the marine environment was modified by creating two separate place meanings', one for 'traditional' economic uses (e.g., marine transportation) and one for 'sustainable' economic uses (e.g., sustainable electricity production). The survey materials did not however provide any definition to these terms or provide examples to avoid introducing bias or priming responses. Participants were asked to rank their top three place meanings. When aggregated across all three choices, aesthetic beauty, recreation, and family/community identity were selected most often. If looking only at top choices, family/community identity and recreation are reversed in order. Considering Block Island alone, pristineness is the third most often top meaning. Interestingly, traditional and sustainable economic uses of the ocean do not rank highly.

Further, respondents were asked to judge whether the BIOWP was consistent, inconsistent or neither consistent nor inconsistent with each meaning they chose. Fig. 2 aggregates results for each meaning across the top 3 choices and displays data for Block Island and the Rhode Island coast separately. Vertical bars indicate total counts for each meaning over level of consistency. Due to small numbers for some meanings, counts are reported instead of proportions. Horizontal bars mark the ratio of inconsistent to consistent designation for each meaning. A higher ratio indicates that a greater proportion of respondents feel that the BIOWP is inconsistent (relative to consistent) with that specific place meaning.

4.4. Theory and calculations

Multivariate regression analysis of theoretically relevant variables is used with the goal of shedding light on the relationship between place/aesthetics and support. Two overall models are presented: ordinary least squares regression for place consistency and logistic regression for support/opposition. Ordinary least squares regression is used because the dependent variable for consistency has seven categories and OLS regression proves to be more stable for the small number of observations from Block Island than ordered logistic regression when consistency is the dependent variable [39]. Logistic regression is used for the regressions on support consistent with firestone and Kempton [26]. A binary support dependent variable was constructed with 'leaning' combined with either support or opposition and neutral responses withheld. The survey population is divided in each model to compare Block Island with the coastal communities. A stratum variable is included in the coastal models to account for unequal selection probability, while demographic variables are included in each model to address differential response rates by gender, age and education and because the demographic variables may be correlated with the dependent variables [40].

Full regressions are presented in the appendix and variable definitions are provided in section 4.4.1. To reduce the effects of collinearity between independent variables and increase design degrees of freedom, a process of k-means clustering commonly referred to as lasso estimation [41] was used to determine which variables to include in each model. The same models are used for both Block Island and the coastal strata other than that the coastal model also controls for stratum and whether or not someone has seen the wind turbines. Logit models employ odds ratios as measures of effect size; linear regression models use partial eta-squared.

4.4.1. Variable definition and descriptions

Table 5 provides definitions and descriptions of the variables along with unweighted means and standard errors. The first group of independent variables consists of those place meanings most often included among the top 3 by respondents either on Block Island or in Coastal Rhode Island. These were family/community identity (family identity), aesthetic beauty (beauty), recreational enjoyment (recreation), pristineness, and solitude/introspection (solitude) and ecological integrity (ecology).

Data on place constructs were collected during the first survey and combined here into a single overarching variable 'place'. These are two 5-category (agree to disagree measures of place attachment and place identity and one of place dependence. The measures are the response to: "The ocean beach I most often visit is one of my favorite places"; "I feel attached to the ocean beach I most often visit; " "The ocean is part of my identity"; "I can really be myself at the ocean; " and "For the things I enjoy most, no place can compare to the ocean."

The next set of independent variables are specific community membership attributes. They include two dichotomous variables: owning or renting a home and whether the island/coastal residence is primary or secondary. The next group of variables is comprised of the top turbine descriptions chosen by supporters and opponents: symbolic of progress towards renewable energy (symbol of progress), impressive, unattractive, and that they represent an intangible loss where all you can see is the ocean (intangible loss).

The last two groups of variables are demographics (age, sex and college education) and a group of 'other' variables, which contains a 5-category variable for the extent of agreement/disagreement with a statement regarding the fit of the wind turbines with the landscape/seascape during daylight hours. This same group also contains a climate change related variable: a 5-category Likert-scaled variable regarding climate change concern.

4.4.2. Regression analysis

The final regression models for support and consistency are presented in this section. Full models are presented in the appendix.

[3] Due to the relatively low number of opponents for whom we have data (N = 43 including leaning), we tabulate their turbine descriptions in Appendix A.

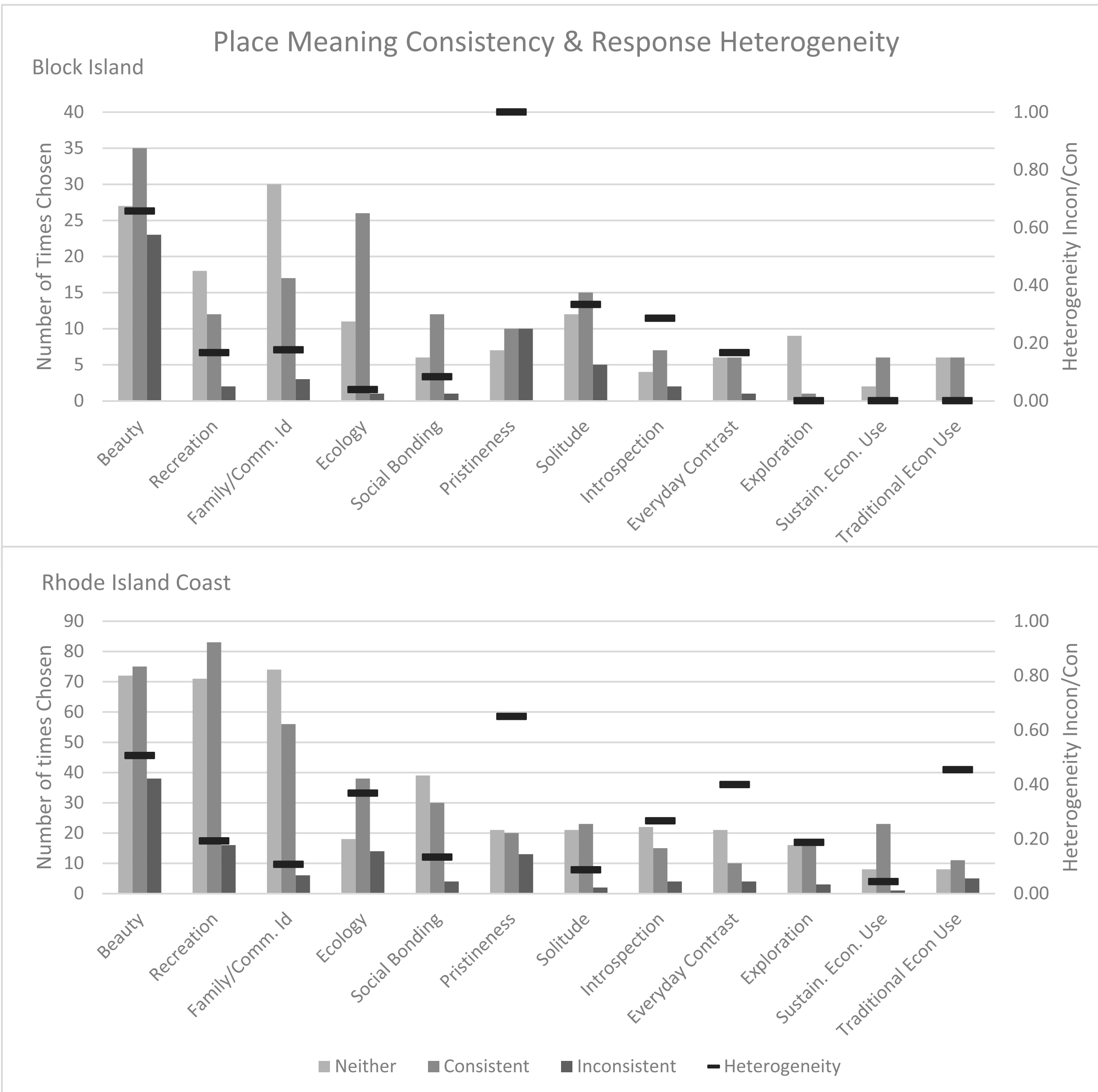

Fig. 2. Counts of choices regarding place meaning and consistency aggregated by status as a 'Top 3' choice. Black horizontal bars indicate the ratio of 'inconsistent' to 'consistent' choices for each meaning.

Table 5
Variable descriptions, definitions, unweighted means, and standard errors (survey 1 and 3).

Variable	Variable Description/Definition	Proportions/Means			
Dependent		Block Island		RI Coast	
		Mean	Std. Err.	Mean	Std. Err.
Consistency	7 category variable of top 3 meaning choices and their consistency with the project (3–9)	6.93	0.19	6.99	0.11
Support	Binary variable ("1" if support, "0" if opposed)	0.87	0.03	0.90	0.02
Independent					
Interchanges					
Consistency	7 category variable of top 3 meaning choices and their consistency with the project (3–9)	6.93	0.19	6.99	0.11
Top Place Meanings					
Family/community Identity	"1" if family/community identity is among top 3 place meanings; "0" if otherwise	0.45	0.05	0.44	0.03
Beauty	"1" if beauty is among top 3 place meanings; "0" if otherwise	0.76	0.04	0.6	0.03
Recreation	"1" if recreation is among top 3 place meanings; "0" if otherwise	0.3	0.04	0.54	0.03
Pristineness	"1" if pristineness is among top 3 place meanings; "0" if otherwise	0.25	0.04	0.17	0.02
Solitude	"1" if solitude is among top 3 place meanings; "0" if otherwise	0.28	0.04	0.14	0.02
Ecology	"1" if ecology is among top 3 place meanings; "0" if otherwise	0.33	0.06	0.22	0.05
Other Place Constructs					
Place	Composite of five 5-category place related variables (beach most often visited is a favorite place, attached to favorite beach, ocean part of identity, can really be myself at ocean, no place compares to ocean (5–25) Cronbach's Alpha = 0.89	22.49	0.34	21.14	0.27
Community Attributes					
Owning Home	"1" if own home; "0" if renting	0.84	0.04	0.84	0.02
Second Home	"1" if own second home; "0" if otherwise	0.24	0.04	0.11	0.02
Turbine Descriptions					
Symbol of Progress	"1" if chosen as a turbine description; "0" if otherwise	0.81	0.04	0.75	0.02
Impressive	"1" if chosen as a turbine description; "0" if otherwise	0.71	0.04	0.54	0.03
Unattractive	"1" if chosen as a turbine description; "0" if otherwise	0.13	0.03	0.12	0.02
Intangible Loss	"1" if chosen as a turbine description; "0" if otherwise	0.28	0.04	0.19	0.02
Demographics					
Age	Age in years	62	1.48	62.5	0.81
Male	"1" if male; "0" if female	0.57	0.05	0.6	0.03
Bachelor's degree	"1" if bachelor's degree or greater; 0 otherwise	0.7	0.04	0.67	0.03
Other					
Strata	"1" if Block Island; "2" if border ocean; "3" if near ocean				
Seen the turbines (coast only)	"1" if yes; "0" if no or unsure			0.54	0.03
Climate Change Concern	5-category variable (not concerned to very concerned) How concerned are you about climate change? (1–5)	4.29	0.1	3.95	0.07
Turbines fit landscape during the day	5-category variable (disagree to agree) (1–5)	3.67	0.15	2.48	0.18

4.4.3. Consistency

In Table 6, results of the consistency regressions are shown separately for Block Island and the Rhode Island coastal communities. After reducing the full models for parsimony, the remaining variable categories are project fit with the landscape, demographics, place meanings, and turbine descriptions.

The Block Island model for consistency explains approximately 65% of model variance (adjusted R^2). Notably on Block Island, whether the turbines fit the landscape is a significant predictor as is having a bachelor's degree or higher education. In fact, the effect-size (partial eta squared) of daytime fit is nearly as large as the other significant predictors combined. Of the included symbolic variables, only describing the turbines as representing an intangible loss is significant. The demographic variables of age and sex as well as included place meanings are not shown to be predictive.

The regression model for consistency on the Rhode Island coast explains approximately 45% of variance, which is less than for Block Island and may be the result of a more heterogeneous population. Daytime fit is still highly significant with an effect size and coefficient greater than that on Block Island ($\eta p2 = 0.16$). No place meanings proved to be significant predictors of consistency for the coastal respondents, however; the turbine description 'unattractive' is. The largest negative coefficient belongs to the turbine description 'unattractive' (coef. = −0.75) although its effect size is not much different than the others. As with Block Island, specific place meaning choices are not significant predictors of consistency although it is perhaps notable, taking standard error into account, that the coefficient for recreation is positive for coastal respondents and negative on the island.

4.4.4. Support

Firestone et al. [1] note the importance of aesthetic factors in overall support/opposition to the BIOWP and here consistency is added to the mix. Models for Block Island and the Rhode Island coast are displayed. Independent variables included in the support regressions include consistency, having seen the turbines, daytime fit, level of concern for climate change, demographics, place meanings, and turbine descriptions.

Table 7 displays the regression results on support. Notably, consistency between the project and place meaning is not a significant predictor of support on Block Island, nor is landscape fit. Pristineness is in fact the only significant predictor with climate change concern being nearly significant ($p = 0.06$), but with a much larger odds ratio. Hosmer-Lemeshow goodness-of-fit post-testing does not indicate that the model should be rejected. As well, running the model as an ordinary least squares regression with a five-category support dependent variable also produces similar results.

The Rhode Island coast model for support has comparatively more significant predictors. Unlike on Block Island, coastal place-consistency shows a statistically significant effect on support ($p = 0.01$, odds ratio = 1.78) as does concern for climate change ($p = 0.01$, odds ratio = 1.68).

Table 6
OLS regression for consistency comparing Block Island and Rhode Island Coast.

	Block Island				RI Coast			
Number of Obs.	=	100			=	252		
R-squared	=	0.65			=	0.48		
Adj R-squared	=	0.60			=	0.45		
Consistency	Coef.	Std. Err.	P > t	ηp2	Coef.	Std. Err.	P > t	ηp2
Seen the turbines	(omitted)	.	.	.	−0.13	0.08	0.10	0.01
Landscape Fit	0.87**	0.24	0.00	0.13	1.07**	0.16	0.00	0.16
Bachelor's degree	0.82**	0.29	0.01	0.09	0.22	0.19	0.25	0.01
Age	0.00	0.01	1.00	0.00	0.00	0.01	0.58	0.00
Male	0.22	0.27	0.42	0.01	−0.07	0.18	0.71	0.00
Pristineness meaning	−0.48	0.34	0.16	0.02	−0.11	0.23	0.64	0.00
Beauty meaning	−0.56	0.30	0.07	0.04	−0.10	0.18	0.60	0.00
Recreation meaning	−0.31	0.29	0.28	0.01	0.16	0.18	0.37	0.00
Symbolic of progress	0.43	0.42	0.31	0.01	0.42	0.24	0.09	0.01
Impressive	0.43	0.33	0.19	0.02	0.22	0.21	0.28	0.00
Unattractive	−0.75	0.59	0.21	0.02	−0.75*	0.34	0.03	0.02
Intangible loss	−0.96*	0.45	0.04	0.05	−0.47	0.28	0.09	0.01

*p < 0.05.
**p < 0.01.

Table 7
Logistic regression for support comparing Block Island and Rhode Island Coast.

	Block Island				RI Coast			
Number of Obs.	=	96			=	244		
Pseudo R-squared	=	0.64			=	0.67		
Project Support	Coef.	Std. Err.	P > z	Odds Ratio	Coef.	Std. Err.	P > z	Odds Ratio
Consistency	0.59	0.42	0.16	1.80	0.58**	0.23	0.01	1.78
Seen the turbines	(omitted)	.	.	.	−0.99	0.68	0.14	0.37
Landscape fit	1.64	1.56	0.29	5.14	0.47	0.82	0.57	1.60
Climate change concern	0.88	0.47	0.06	2.40	0.52**	0.21	0.01	1.68
Bachelor's degree	−1.18	1.06	0.27	0.31	−0.22	0.78	0.78	0.80
Male	0.83	0.91	0.36	2.30	0.87	0.86	0.31	2.38
Age	−0.04	0.06	0.50	0.96	0.01	0.03	0.84	1.01
Pristineness meaning	−3.23*	1.34	0.02	0.04	2.29**	0.83	0.01	9.91
Impressive	1.54	1.80	0.39	4.65	2.07**	0.77	0.01	7.91
Symbolic of Progress	1.50	1.27	0.24	4.48	3.51**	1.23	0.00	33.53
Unattractive	0.08	1.37	0.96	1.08	0.23	0.96	0.81	1.26
Intangible loss	3.22	2.19	0.14	25.06	−1.66*	0.83	0.04	0.19

*p < 0.05.
**p < 0.01.

Additionally, pristineness is significant (p = 0.01, odds ratio = 9.91) as a positive predictor of support where it is negative on Block Island. Turbine descriptions 'symbolic of progress' and 'impressive' are significant predictors of support, whereas 'intangible loss' is the only significant negative predictor. Pristineness as a top 3 place-meaning and the turbine descriptions 'symbolic of progress' and 'impressive' all have large odds ratios with 'symbolic of progress' showing the largest across both population (odds ratio = 33.53).

5. Discussion

By incorporating elements such as place meaning and place consistency into the survey, the research team sought to better understand residents' relationship with the sea and further shed light on what is correlated with project support and opposition.

With the BIOWP in operation for more than a year, mean support remained high and not significantly different across the entire population. The important distinction is that the island residents appear surer in their support, while the distinction between 'leans support' and full support is more important on the coast. This may indicate that the closer a community is to a project, the more easily or quickly it may crystallize its attitude. It is possible that communities may become ambiguous to aesthetics over time, as offshore wind power becomes commonplace [24]. Further research is needed to investigate what this means for the transition between present support/opposition and future attitudes.

Insights from Bates and Firestone [33] supported the inclusion of a conceptualization of consistency between the project and place. This work focused on residents' conceptualizations of both the turbines themselves and of the ocean and coastal environment. By over three to one, more islanders and coastal residents considered the project consistent with their chosen top place meanings rather than inconsistent, and about 40% chose neither. The ratio is smaller for pristineness and aesthetic beauty, showing that more respondents do feel that the project is inconsistent with these two place meanings. In addition, pristineness seems to be conceptualized differently between the two populations – with adherence to pristineness as a place meaning being a negative predictor of support for island residents and a positive one for coastal respondents. These results show similarity to findings regarding place attachment and offshore wind in Bates and Firestone [33] where Atlantic City, New Jersey and coastal Delaware were compared.

The apparent relationship between the turbines' fit with the landscape and the symbolic variables in the regression models is also interesting. Whether or not the turbines fit the landscape/seascape is a prominent predictor in the consistency regression models and islanders exhibit a significant difference from the coastal population when comparing means over the populations. The regressions on consistency were not strongly influenced by most of the included turbine descriptions and place meanings for either population. The only significant relationships were to the wind turbines representing an intangible loss for islanders and being unattractive on the coast. If fit is constrained, however; all the included turbine descriptions become significant predictors of consistency on the coast and chosen place meanings, although not reaching statistical significance, show increased effect size for Block Island. This finding agrees with Mclachlan [42] that "symbolic logics" are important and can overshadow or, in this case, interact with other facts and figures regarding the benefits of a project.

The proximity of the islanders to the project might give them more opportunity for reflection on landscape interactions than coastal residents who see them remotely or at a distance, thus filtering how the project is experienced. In terms of what this means for a project's effect on populations that are 'local' to it, this may indicate an unexplored nuance that researchers can tap into. On the other hand, fit was not a significant predictor of support, but has a larger effect size on the island than the coast. These differences should propel future research into further probing whether landscape effects are more important near projects but become weaker predictors of consistency and support at distance.

Turning to the support regressions, the obvious distinction is the difference in the importance of symbolic aspects of place and the project. 'Pristineness' was the only significant description of the project among Block Islanders. For coastal residents, fit with the landscape was not significant while intangible loss where all you see is the ocean was, indicating that notions of landscape go beyond a characterization as lack of fit to a more profound sense of loss of place. At the same time, the most dominant factor among coastal residents was considering the turbines to be symbols of renewable energy progress. The differing signs of the significant coefficients for intangible loss and pristineness on the coast deserve comment as well. It is possible that respondents feel that the project is not detrimental to the pristineness of the ocean, perhaps in terms of its remaining unpolluted and able to maintain ecosystem functions, but that there is a human loss in terms of what the ocean represents.

The finding that place meanings and turbine descriptions are playing different roles depending on location, especially that turbine conceptualization is such a powerful predictor for the coast raises the question of how and why places become meaningful to different populations and whether physical distance is a determining factor in differentiating perceptions of inconsistency with place meanings from perceptions that a project is 'out of place'.

Lastly, when considering consistency of place meaning and the project as an influencer of support there is not a strong relationship on Block Island when controlling for other important variables. On the other hand and in addition to the project's symbolic nature [42], consistency with place meaning is important to the coast. It should also be noted that, across all models, significant place meanings did not typically influence the regression models in terms of effect size or odds ratio. The exception is in the regression for coastal support where place meanings are strong predictors, although not as strong as the turbines being symbolic of progress. Place was for the most part not statistically significant and fell out of the reduced models.

This work contributes to the place meaning literature [31] by focusing on specific and special geographies at the coast and the island – places that are, in this case, associated strongly with natural beauty as well as recreation and socialization. The findings agree with a literature outlining a connection between lower support for renewable energy infrastructures and feelings that the ocean is pristine or wild [1,26]; however, this correlation should not be taken as the rule and depends on factors unique to each community. Pasqualetti's common opposition threads of immutability of the landscape and solidarity with place [11] and Devine-Wright and Howe's characterization of 'in place or 'out of place' [32] appear more important on the island. In contrast, coastal residents give more weight to turbine descriptions.

Our unique approach has been to focus on perceived consistency of an offshore wind project with a given place meaning. Case studies of place meaning, as this is, are necessary due to the breadth of potential associations people have with their surroundings. After all, a place is simply a location imbued with some meaning [43] and while place meaning is often associated with place attachment [30], it has been interesting to attempt to compare and contrast the two. This scholarship becomes more complex when also considering descriptions (analogous of meanings in this context) of the wind turbines with the meanings associated with their location. These have been called "logics of opposition or support" [42] and may further be complicated when also incorporating meanings of place that may be negative or ambiguous [44].

As for limitations, it should be noted that this project is unique in comparison to other offshore wind installations in that it is small and relatively close to a population center. The responses of the Block Islanders are not easily generalizable to other geographies as it is unlikely that many offshore projects will be placed so close to a community in the U.S. It is also possible that the choice of place meanings in this work is not representative of the island or coastal population. Under a different method, it would be useful to conduct interviews or focus groups to better understand the nuances of place meaning in this setting. The survey question about consistency between the BIOWP and respondents' chosen meanings received a high proportion of 'neither consistent nor inconsistent' responses. This leaves a question of interpretation and survey construction going forward. Lastly, survey methodology and especially longitudinally constructed surveys are impacted by non-response error and the bias it introduces. More statistical power in the form of a larger number of observations would likely clarify these results, especially for the Block Island population.

6. Conclusion

Block Islanders and coastal residents who support the project and find it consistent with their place-meanings are the majority, yet, they differ in their relationship to the sea and to the project [7]. Judgements of consistency between the project and place meanings are generally positive and play a role in support but differ between the island and coast. Indeed, support is tied to different aspects of aesthetic value attributed to the project. Namely, the appearance of the turbines and what they stand for are dominant drivers for the coast, and the turbines' perceived detrimental impact on landscape is important on the island. Contrastingly, landscape effects (fit) appear to dominate the prediction of whether residents find the project consistent with chosen place meanings although fit correlates with different variables depending on location.

Research on the relationship between place meaning and project support is seldom found in literature and dovetails nicely with the unique case of the BIOWP. It is a local project with some of the complexity of a largescale offshore wind installation and, due to it being the US's first, it will stand as a proven example for better or for worse. Here, one of the more important aspects of stakeholders' concerns has been expanded in the hope that industry, policymakers, and regulators engage appropriately. That will certainly mean, not only asking for feedback [15], which comes readily from attuned supporters and opponents, but also going further to understand that each community will have a unique understanding of its surroundings and also focus on different elements of a project as either good or bad. Failure to appreciate these nuances, will more than likely be associated with delays or even failure in future projects. Conversely, attending to them creates opportunities for learning best practices going forward.

Author contributions

Aaron Russell: Writing - original draft, Formal analysis, Data curation, Visualization. **Jeremy Firestone:** Supervision, Project administration, Funding acquisition, Conceptualization, Writing - review & editing, Investigation, Resources, Data curation. **David Bidwell:** Investigation, Resources, Conceptualization, Writing - review & editing. **Meryl Gardner:** Writing - review & editing, Conceptualization.

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Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Funds for this research were provided by First State Marine Wind, LLC, (FSMW), a private corporation that owns and operates a 2 MW wind turbine adjacent to the University of Delaware's (UD) Lewes campus and by the UD-DEMEC and Magers Family Graduate Fellowship. FSMW, which is majority controlled by UD, uses its revenues to further wind energy research. Professor Firestone has held various roles related to the wind turbine since its commissioning in 2010, and has been a Director of FSMW since 2016. He was not involved in the decision to allocate either FSMW or graduate fellowship funds to the project. The other authors declare no interests.

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Appendix A. Top positive and negative turbine descriptions

Table A.1
Turbine Descriptions broken down by support/opposition as well as positive and negative descriptions.

	Support	Oppose
Description	n = 341	n = 43
Positive		
Impressive	64%	19%
Symbolic of progress towards clean energy	86%	12%
Adding to the island/coastal character	20%	5%
Attractive	16%	2%
Amazing	28%	2%
Beautiful	12%	0%
Negative		
Detracting from the island/coastal character	10%	70%
Cause the loss of something intangible, where all you see is the ocean	15%	63%
Unattractive	6%	60%
Industrial	16%	60%
Too big	6%	37%
Ordinary	4%	19%
Other	6%	21%

Appendix B. Top place meanings by stratum

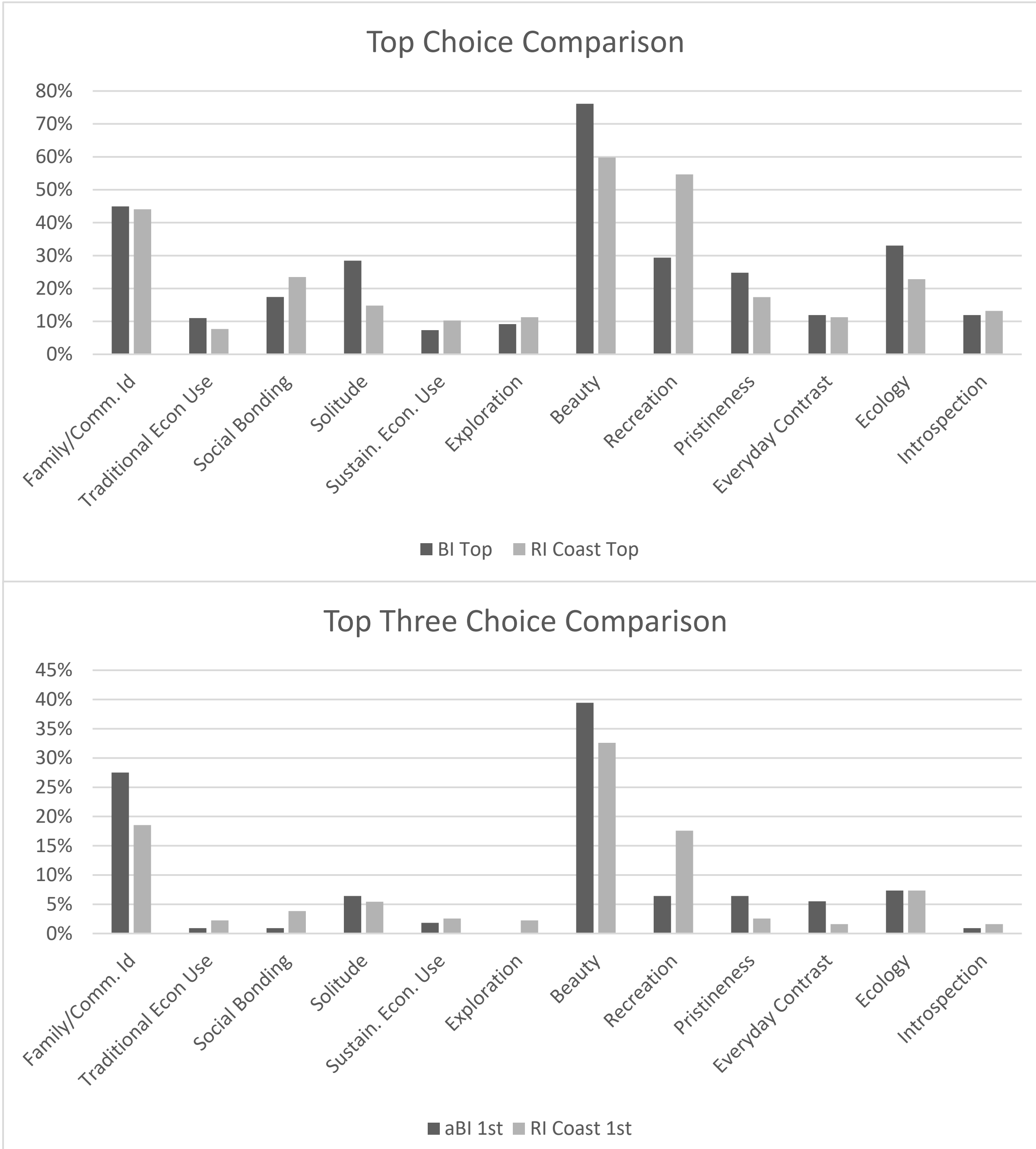

Figure B.1. Proportions of place meanings chosen as one of the top (first choice) (top figure) and proportions of place meanings chosen as one of the top three (bottom figure). Dark gray bars represent place meanings on Block Island while light gray bars represent coastal Rhode Island.

Appendix C. Full regression models

Table C.1
Full OLS regression model for consistency. Includes all variables prior to lasso selection.

	Full Population			
Number of Obs.	=	325		
R-squared	=	0.55		
Adj R-squared	=	0.52		
Consistency	Coef.	Std. Err.	P > t	ηp2
Family/community identity meaning	−0.19	0.18	0.27	0.00
Aesthetic beauty meaning	−0.33*	0.17	0.05	0.01
Recreation Meaning	0.06	0.16	0.73	0.00
Pristineness Meaning	−0.26	0.21	0.21	0.01
Solitude Meaning	0.01	0.20	0.94	0.00
Ecology Meaning	0.18	0.18	0.33	0.00
Place	0.03	0.02	0.16	0.01
Owning home	−0.06	0.23	0.78	0.00
Owning second home	−0.33	0.22	0.13	0.01
Symbol of progress	0.57*	0.23	0.02	0.02
Impressive	0.27	0.17	0.12	0.01
Unattractive	−0.63*	0.30	0.03	0.01
Intangible loss	−0.68**	0.23	0.00	0.03
Age	0.01	0.01	0.21	0.01
Male	0.11	0.16	0.49	0.00
Bachelor's degree	0.47**	0.17	0.01	0.02
Strata	0.08	0.11	0.46	0.00
Seen the turbines	−0.34*	0.18	0.07	0.01
Climate change concern	0.00	0.08	0.97	0.00
Landscape fit	1.01**	0.13	0.00	0.16

*$p < 0.05$.
**$p < 0.01$.

Table C.2
Full logistic regression model for Support. Includes all variables prior to lasso selection.

	Full Population			
Number of Obs.	=	318		
Pseudo R-squared	=	0.65		
Consistency	Coef.	Std. Err.	P > t	Odds Ratio
Consistency with place meanings	0.51*	0.25	0.04	1.66
Family/community identity meaning	1.44	0.83	0.08	4.20
Aesthetic beauty meaning	0.02	0.81	0.98	1.02
Recreation Meaning	0.36	0.71	0.61	1.43
Pristineness Meaning	1.63	1.00	0.10	5.13
Solitude Meaning	2.27	1.21	0.06	9.70
Ecology Meaning	0.36	0.88	0.69	1.43
Place	0.01	0.07	0.90	1.01
Owning home	0.30	1.26	0.81	1.35
Owning second home	−0.56	0.91	0.54	0.57
Symbol of progress	3.14**	0.83	0.00	23.18
Impressive	0.81	0.72	0.26	2.26
Unattractive	−0.27	0.89	0.76	0.76
Intangible loss	−0.71	0.79	0.36	0.49
Age	0.01	0.03	0.82	1.01
Male	0.46	0.72	0.52	1.59
Bachelor's degree	0.04	0.79	0.96	1.04
Strata	0.57	0.50	0.25	1.77
Seen the turbines	−0.80	0.92	0.38	0.45
Climate Change Concern	0.45	0.27	0.10	1.56
Landscape fit	0.96	0.66	0.15	2.61

*$p < 0.05$.
**$p < 0.01$.

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