

**A REVIEW OF BUSINESS SURVEYS (2010 TO 2021)  
FROM COMMUNITIES PROXIMATE TO OREGON MARINE RESERVES**

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SEPTEMBER 28, 2021**



**Marine  
Resources**

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## EXECUTIVE SUMMARY

### INTRODUCTION

When the state of Oregon began a process to establish a limited system of marine reserves within state territorial waters in 2008, the Oregon Department of Fish and Wildlife (ODFW) was designated the lead agency responsible for implementing and managing the system. ODFW oversees the five marine reserve sites at Cape Falcon, Cascade Head, Otter Rock, Cape Perpetua, and Redfish Rocks. The goals of the Oregon Marine Reserve system are:

- Conservation*    Conserve marine habitats and biodiversity.
- Research*        Serve as scientific reference sites to investigate marine reserve protections and the Oregon territorial seas, to inform nearshore ocean management.
- Communities*    Avoid significant adverse impacts to ocean users and coastal communities.

To achieve these goals, ODFW established a program in 2009 for marine reserves implementation and monitoring. In this context, the Marine Reserves Human Dimensions Project conducts studies to determine the direct and indirect social, cultural, and economic impacts which result from reserve site implementation. The information collected through this process should be relevant to other marine and coastal natural resource policy issues in Oregon. This paper reviews a series of studies conducted to identify awareness of and perceptions about marine reserves among owners and managers of businesses located in towns near the marine reserves, and changes in these metrics that may have occurred over time. How the reserve system may have impacted coastal businesses can have significant implications for the economies of Oregon coastal communities.

### RESEARCH DESIGN

Beginning in 2010, the Human Dimensions Project initiated a study to ascertain how businesses may be affected by the marine reserves. The primary objective of this research was to collect and analyze data about business characteristics, and business managers', owners' and key employees' knowledge and perceptions of coastal tourism and marine reserve impacts on local businesses. Baseline data were collected at the early stages of marine reserve implementation and a comparative study was conducted during the summer of 2021. The sampled businesses were located near the reserves in towns most likely to be impacted by marine reserve designation. The subsequent 2021 study assesses how perceived business impacts and local knowledge of marine reserves may have changed over time.

The studies conducted in 2010 and 2011 used a structured interview with the possibility for open-ended responses. The 2014, 2015, and 2021 studies used a survey instrument with closed-ended questions (e.g., multiple choice options). Business owners, managers, and key employees were asked about the general nature of their business and customer base, awareness of marine reserves, and potential marine reserve impacts on visitors to the area and their business demand.

Business surveys were conducted during the summer months in towns located nearest to the marine reserves (Table ES1). The surveys were conducted in Port Orford, Florence, Newport, Otter Rock, Lincoln City, Yachats, Manzanita, Garibaldi, and Depoe Bay. In the earliest studies (2010 – 2011) a stratified sampling design was used. First, the total number and approximate sizes of businesses by sector was determined. From this business matrix, a stratified sample of businesses was selected to contact to achieve a representative sample of most business types in each community. In 2014, 2015, and 2021, the relatively small numbers of businesses located in Yachats, Depoe Bay, Garibaldi, and Florence allowed for the surveys to be conducted as a census of all relevant businesses within the city boundaries.<sup>1</sup> During the 2021 survey, the businesses contacted in the larger towns of Newport and Lincoln City were systematically sampled, with every other related business along major business corridors contacted. The 2021 study only contacted businesses that were characterized as having visitors as their primary customer base.

**Table ES1. Business Survey Sample Designs by Location, Year, and Relevant Reserve**

Survey Year	Reserve	Towns	Sample Frame	Sample Size
2010	RR, CH, CP	Port Orford, Yachats, Depoe Bay, Lincoln City	Stratified	n = 79
2011	OR	Newport, Otter Rock	Stratified	n = 74
2014	CP, CF, CH	Manzanita, Garibaldi, Depoe Bay, Yachats	All Related Businesses	n = 87
2015	CP	Florence	All Related Businesses	n = 80
2021	CP, OR, CH, CF	Florence, Yachats, Newport, Otter Rock, Depoe Bay, Lincoln City	All Related Businesses	n = 341

Note: Restrictions were implemented at Otter Rock and Redfish Rocks in 2012, Cape Perpetua and Cascade Head in 2014, and Cape Falcon in 2016.

Business surveys were conducted in person at the business location, and the owner, manager, or first available employee who felt like they could answer questions on behalf of the business was asked if they would be willing to take a brief survey about the impacts of marine reserves on their business. Willing participants were then either interviewed by the ODFW employee or asked to fill out a one-page survey on a clipboard.

## RESULTS

Baseline data were collected in the summer months of 2010, 2011, 2014, and 2015. Comparative data were collected in the summer of 2021. The proportion of business

<sup>1</sup> For Yachats, the survey scope was extended to all businesses within the city boundaries and near the marine reserve.

representatives who reported local ownership increased from 78.1% to 89.5%. This reflects the intentional change in the study design to focus on tourist-oriented businesses.

Marine reserve awareness among business representatives did not change significantly between the baseline and comparative studies. Florence was an exception where the largest change between the baseline and comparative studies was an increase in those who were unsure if they were aware or not of the marine reserves (fishers exact p-value<0.001).

Perceived impact of the marine reserves on business demand did change significantly between the baseline and comparative studies (p-value<0.001). The perceived impact became more neutral, less positive, and less negative in 2021. This change in results over time was similar to changes observed in Yachats and Depoe Bay between 2010 and 2014. The proportion of respondents who felt business demand would be negatively impacted by the marine reserves decreased from 32.6% in baseline studies to 1.5% in the comparative study. Additionally, the proportion of respondents that thought business would not change because of marine reserve implementation or who were unsure about marine reserve impacts increased from 54.5% to 90.0%.

## CONCLUSIONS

A large majority of survey responses in both the baseline (78.1%) and comparative (89.3%) studies came from business representatives who reported the business was locally owned. The proportion of respondents representing locally owned businesses increased in all towns between the baseline and comparative studies.

Marine reserve awareness did not change significantly between the baseline surveys and the comparative survey. A higher proportion of respondents in 2010 and 2011 reported being aware of the marine reserves (57.5%) than those surveyed in 2014 and 2015 (38.9%). The combined marine reserves awareness among all respondents in the baseline studies (2010 – 2015) was 47.8%, while in the comparative study, the proportion of business representatives who were aware of the marine reserves was 45.9%.

There was a significant difference in perceived impact of marine reserves on business demand between those who reported being aware of the marine reserves and those who reported being unaware. Respondents who were aware of the marine reserves were more likely to say that business had increased as a result of the marine reserves or that there had been no change in business demand. Those who were not aware were more likely to be unsure of the impact marine reserves had on their business.

The overall perceived impact of marine reserves on businesses changed significantly between the baseline and comparative studies ( $\chi^2= 128.16$ , df= 2, p-value<0.001, n=660). The predominant trend was a decrease in negative perceived impacts and an increase in neutral perceived impacts. This trend holds whether the 2021 comparative study is compared to the composite data of all baseline studies

(2010 – 2015) or just the 2014/2015 data, when the sample design was most similar to the current comparative study ( $\chi^2 = 59.608$ ,  $df = 3$ ,  $p\text{-value} < 0.001$ ,  $n = 507$ ).

## INTRODUCTION

Establishment of Oregon's limited marine reserve system began in 2008 with Executive Order 08-07 (2008). The locations for the Marine Reserves and Marine Protected Areas (MPAs) were chosen through an extensive public engagement process that prioritized maximizing ecological benefits while avoiding negative impacts to coastal communities. The reserves, which collectively cover under four percent (4%) of Oregon's territorial sea, prohibit the removal of marine life and ocean development. Some sites have an adjoining MPAs that allow some harvest activity but no ocean development. State mandates and guidelines for the Oregon marine reserves are provided in Executive Order 08-07 (2008), House Bill 3013 (2009), Senate Bill 1510 (2012), administrative rules adopted by state agencies (OAR 635-012, OAR 141-142, and OAR 736-029), and in the *Oregon Marine Reserve Policy Recommendations* adopted by the Oregon Ocean Policy Advisory Council (OPAC) in 2008. Implementation, management, and monitoring responsibilities were assigned to the Oregon Department of Fish and Wildlife (ODFW).

### OREGON MARINE RESERVE GOALS

Based on the OPAC policy recommendations (OPAC 2008), the goals of the Oregon Marine Reserve System are:

- Conservation**    Conserve marine habitats and biodiversity.
- Research**        Serve as scientific reference sites to investigate marine reserve protections and the Oregon territorial seas, to inform nearshore ocean management.
- Communities**    Avoid significant adverse impacts to ocean users and coastal communities.

### PROGRAM EVALUATION IN 2023

A legislatively mandated evaluation of the Oregon Marine Reserves Program will occur in 2023. The evaluation will include an assessment of all aspects of the program including site management, ecological monitoring, outreach, community engagement, compliance, enforcement, and an assessment of the socioeconomic impacts of the reserves. Part of ODFW's management and monitoring plan included the development of the Human Dimensions Project. The Oregon Marine Reserves Human Dimension Monitoring and Research Plan (Murphy, et. al., 2012; ODFW, 2017) documents the project objectives and research purposes. To contribute to the evaluation of the marine reserve system, the studies conducted by the ODFW Marine Reserves Human Dimensions Project are designed to address the following:

- Determine if marine reserves increase our knowledge of the Oregon nearshore environment, resources, and uses. Ascertain if this information is useful to support nearshore resource management.
- Determine if the marine reserves and associated MPAs, and the system as a whole, avoid significant adverse social and economic impacts to ocean users and coastal communities.

To achieve these goals, businesses located in towns near marine reserves were surveyed in 2010, 2011, 2014, and 2015 (prior to restrictions being put in place at the closest reserve) to establish a baseline of



marine reserve awareness and perceptions of marine reserve impacts on business demand (Epperly, et al., 2017). A similar survey of relevant businesses was implemented during the summer of 2021. The 2021 survey could then be used to ascertain if there had been a change in awareness and/or perceived impacts of marine reserves between the current time and when the marine reserves were implemented.

## RESEARCH DESIGN

### RESEARCH OBJECTIVES

The primary objective of this human dimensions research was to collect and analyze data about business characteristics, and business managers', owners' and key employees' knowledge and perceptions of marine reserve impacts on local businesses. The establishment of baseline data taken at the early stages of phased marine reserve implementation was important to determine the initial state of businesses located in towns most likely to be impacted by marine reserve designation. Replication of this research in 2021 provided the data for assessment of how businesses may or may not have changed over time.

### INTERVIEW INSTRUMENT DESIGN

The studies conducted in 2010 and 2011 used a structured interview with the possibility for open-ended responses to some questions. To collect more quantifiable data, the questionnaire for the 2014, 2015, and 2021 studies was a survey instrument with closed-ended questions (e.g., multiple choice options). Such a questionnaire design allows the respondent to participate in a largely self-administered manner. Business owners, managers, and key employees were asked about the general nature of their business and customer base, awareness of marine reserves, and potential marine reserve impacts on their business demand. The purpose of these studies was to gather information on:

- The types, ownership, ages and other characteristics of businesses in the communities
- Perceived motivations for area visitation
- Respondents' awareness of marine reserve site planning and designation
- Respondents' opinions of possible reserve effects on area visitation and business

There were minor differences in the instruments used in the 2010 and 2011 studies, the 2014 and 2015 studies, and the 2021 study. The studies conducted in 2010 and 2011 included additional questions on the business' proportion of local customers and on knowledge and engagement with the marine reserve community groups. The studies conducted in 2014 and 2015 contained a question asking respondents to specify the primary reason they believe that visitors are attracted to the area. The survey conducted in 2021 only included questions regarding business ownership, year established, marine reserve awareness, and perceived impacts of marine reserves on business demand. This shorter survey design was intended to reduce response burden and increase response rate. Survey instruments are shown in Appendices A, B, and C.

### SAMPLE DESIGN

Business surveys were conducted during the summer months in towns located nearest the marine reserves and therefore most likely to be impacted by reserve designation. As the marine reserves were phased in over several years, studies were conducted in multiple years prior to reserve implementation to establish baseline data (Table 1). The first baseline study was conducted in 2010 and 2011 prior to restrictions taking effect at Otter Rock and Redfish Rocks Marine Reserves in 2012. Data were collected in the proximate towns of Port Orford, Depoe Bay, Yachats, and Lincoln City in 2010 and in Newport and Otter Rock in 2011. The second baseline study was conducted in 2014 and 2015 prior to restrictions taking effect at Cape Perpetua and Cascade Head Marine Reserves in 2014 and Cape Falcon Marine Reserve in 2016. Data were collected in the proximate towns of Depoe Bay, Yachats, Manzanita, and Garibaldi in 2014 and Florence in 2015. The 2021 study collected data in Newport, Lincoln City, Florence, Depoe Bay, Yachats, Garibaldi, and Otter Rock. Port Orford and Manzanita were not sampled in 2021 due to time constraints and small sample size, respectively.

**Table 1. Business Survey Sample Designs by Location, Year, and Relevant Reserve**

Survey Year	Reserve	Towns	Sample Frame	Sample Size
2010	RR, CH, CP	Port Orford, Yachats, Depoe Bay, Lincoln City	Stratified	n = 79
2011	OR	Newport, Otter Rock	Stratified	n = 74
2014	CP, CF, CH	Manzanita, Garibaldi, Depoe Bay, Yachats	All Related Businesses	n = 87
2015	CP	Florence	All Related Businesses	n = 80
2021	CP, OR, CH, CF	Florence, Yachats, Newport, Otter Rock, Depoe Bay, Lincoln City	All Related Businesses	n = 341

In 2010 and 2011, a stratified sample design was used. First, the total number and approximate sizes of businesses by sector was determined in each town. From this business matrix, a stratified sample of businesses was selected to contact to achieve a representative sample of business types in each community. The relatively small number of businesses located in Yachats, Depoe Bay, Garibaldi, and Florence allowed for the surveys in 2014 and 2015 to be conducted as a near census of all related businesses within the city boundaries.<sup>2</sup> During the 2021 study, a systematic sample of all visitor-centric businesses was used in Newport and Lincoln City. This systematic sample consisted of sampling every other establishment along commercial corridors that was categorized as one of four business sectors (retail, lodging, restaurant, and visitor services). For example, if a hotel, restaurant, souvenir shop, and charter company were passed by the surveyor in that order, only the hotel and souvenir shop would be sampled. If a business representative declined, the next business that fell into one of the four

<sup>2</sup> For Yachats, the survey scope was extended to all businesses within the city boundaries and near the marine reserve.

categories would be sampled. Near census samples were conducted in all other towns surveyed in 2021. As would be expected, Newport and Florence, the largest cities involved, had the highest number of responses in both the baseline and comparative studies. Lincoln City had the greatest increase in number of respondents between the baseline and current study, more than doubling from 29 respondents in the baseline study to 75 in the comparative study (Table 2). The change in sample design is the basis for this increase.

**Table 2. Number of Businesses Sampled within each Town**

Community	Baseline Surveys 2010-2015		Comparative Survey 2021	
	Frequency	Percent	Frequency	Percent
Newport	67	20.9%	92	27.0%
Florence	80	25.0%	78	22.9%
Otter Rock	7	2.2%	3	0.9%
Lincoln City	29	9.1%	75	22.0%
Garibaldi	23	7.2%	21	6.1%
Depoe Bay	45	14.1%	37	10.8%
Yachats	51	15.9%	35	10.3%
Port Orford	18	5.6%	0	0%
<b>Total</b>	<b>320</b>	<b>100.0%</b>	<b>341</b>	<b>100.0%</b>

Baseline N = 320, Comparative N = 341; Missing = 0

Table 2 Notes:

1. The 2010 and 2011 study was a stratified sample that included the sectors construction (N=6), education (n=4), F.I.R.E. (n=1), health (n=6), and government (n=23). These sectors were not present in the 2014, 2015, or 2021 surveys.
2. The manufacturing sector was included in the 2010 and 2011 survey (n=3) and the 2014 and 2015 survey (n=1), but not the 2021 survey
3. The “Other Services” sector was included in the 2010/2011 and 2014/2015 surveys while the 2021 survey included “Visitor Services.” It was unclear to what degree these two categories were comparable.
4. Yachats baseline survey was conducted twice during the base line period, in 2010 (n = 16) and 2014 (n = 35), as was the baseline study in Depoe Bay (n = 16 in 2010 and n = 29 in 2014). The increase in sample size was due to a change in design from a stratified sample to a near census of related businesses.

The 2010 and 2011 study included interviews of representatives from a sample across all business sectors. However, the 2014, 2015, and 2021 studies only surveyed businesses that were characterized as having visitors as their primary customer base. Businesses within the economic sectors of construction, education, F.I.R.E.<sup>3</sup>, health, government, and manufacturing were not included in the 2014, 2015, and 2021 studies. Businesses catering more to locals, such as hair salons, medical offices, and computer repair shops were also excluded in the 2014, 2015, and 2021 studies. Banks and real estate agencies were included in 2014 and 2015 because they were characterized as having an important role in supporting local businesses. The sample for the 2021 survey included representatives of four business sectors: lodging,

<sup>3</sup> F.I.R.E. is an acronym for Fire, Insurance, and Real Estate.

retail, restaurant, and visitor services. The baseline studies included a sample of representatives of the lodging, retail, and restaurant sectors, as well as several other categories that are not directly comparable to the 2021 sample. Retail and lodging made up the largest proportion of businesses sampled in both baseline and comparative studies (Table 3).

**Table 3. Number of Businesses Sampled within each Economic Sector**

Sector	Baseline 2010-2015		Comparative 2021	
	Frequency	Percent	Frequency	Percent
Lodging	43	15.7	51	15.0%
Retail	122	44.5%	145	42.5%
Restaurant	60	21.9%	116	34.0%
Visitor / Other Services <sup>3</sup>	49	17.9%	29	8.5%
<b>Total</b>	<b>274</b>	<b>100.0%%</b>	<b>341</b>	<b>100.0%</b>

Baseline N = 274, Comparative N = 341; Missing and excluded = 46<sup>4</sup>

#### DATA COLLECTION PROTOCOL

Business surveys were conducted in person at the business site, and the owner, manager, or first available employee who felt like they could answer questions on behalf of the business was asked if they would be willing to take a brief survey about the impacts of marine reserves on their business. Willing participants were then either interviewed by the ODFW employee or asked to fill out a one-page survey on a clipboard. The ODFW employee was available to answer any questions the respondent may have had when responding to the instrument. Responses were coded numerically for data analysis.

Respondents to the 2010 and 2011 surveys who were not aware of the marine reserve closest to their community were shown a map of the reserve boundaries and regulations before they were asked about their how they perceived the reserve would affect visitation and their business. In the subsequent surveys, a map or explanation of the marine reserve location was provided upon request from the respondent.

#### STATISTICAL ANALYSIS METHODS

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<sup>4</sup> The 2010/2011 study was a stratified sample that included the sectors construction (n=6), education (n=4), F.I.R.E. (n=1), health (n=6), and government (n=23). These sectors were not present in the 2014, 2015, or 2021 surveys and are not included herein. The manufacturing sector was included in the 2010 and 2011 survey (n=3) and the 2014 and 2015 survey (n=1), but not the 2021 survey. The “Other Services” sector was included in the 2010/2011 and 2014/2015 surveys while the 2021 survey included “Visitor Services.” It is unclear to what degree these two service business categories were directly comparable.

Statistical analyses were focused on addressing the primary research objectives of assessing perceived impacts of marine reserves on businesses and marine reserve awareness among business representatives. Visual comparisons of response frequencies were deemed adequate for comparing the data from other questions in the instruments.

For those unfamiliar with the statistical procedure, a chi-square test of independence is used to determine if two variables are significantly related. In this report, one of those variables is study type (i.e., baseline or comparative) and the other variable is responses to a question in the survey. For example, we use a chi-square test to determine if responses to marine reserve awareness differs between the baseline and comparative studies; in other words, are awareness and study type related? Answering this question is a multistep process. First, we create a contingency table (a.k.a., a “crosstab”) with the observed counts for each variable combination (study and response). Then, we calculate the expected values for each cell in a contingency table by multiplying the row total by the column total and then dividing by the grand total. Next, for each cell, we calculate the difference between the observed and expected values and square that difference. To calculate the chi-square statistic, sum all of these squared differences. Compare the test statistic to a pre-determined value from the chi-square distribution to determine significance. All of these steps are accomplished using the “`chisq.test()`” command in R.

While understanding if two variables are significantly related is helpful, the total chi-square statistic does not tell us how the variables are related. To determine which cell in a contingency table is driving statistical significance, we look at the chi-square statistic for each cell, also called the Pearson residuals ( $r$ ). To calculate the percent contribution of a given cell to the total chi-square statistic, square the cell’s chi-square statistic, divide by the total chi-square statistic, and multiply by 100.

## RESEARCH RESULTS

Data were collected at a total of 320 businesses during the baseline studies and 341 businesses during the comparative study. As previously described, the survey instrument contained questions pertaining to business characteristics, perceived visitor attractions in the region, awareness and perceptions of marine reserves, and perceived marine reserve impacts.

### COMPOSITE RESULTS FROM ALL STUDIES

This section includes combined results from all baseline surveys conducted in 2010, 2011, 2014, and 2015 compared to the results of surveys conducted in 2021. The majority of coastal businesses sampled in the baseline and comparative studies were owned by local residents, 78.1% and 89.3% respectively (Table 4). This proportional increase reflects a change to the study design in 2021; managers in large “big box” chain stores and other unrelated businesses were not contacted. This was an intentional change to only target businesses that would be more dependent on tourism.

**Table 4. Local or Non-Local Business Ownership**

Type	Baseline 2010-215		Comparative 2021	
	Frequency	Percent	Frequency	Percent
Local	250	78.1%	301	89.3%
Non-local <sup>1</sup>	67	20.9%	28	8.4%
Unsure <sup>2</sup>	3	0.9%	8	2.4%
Total	320	100.0%	337	100.1%

Baseline N = 320, Comparative N = 337; Missing = 4

<sup>1</sup> The 2021 survey separated non-local ownership into “non-coastal Oregon owned” and “not Oregon owned.” These two responses were combined into the “non-local” category for comparison

<sup>2</sup> The option “Unsure” was not included in the 2010 and 2011 study.

A large majority of business representatives interviewed in both the baseline studies (79%) and the 2021 study (83%) reported their business was established after 1981 (Table 5). There was a substantial increase in newer businesses established after 2011 represented among the respondents in the 2021 study.

**Table 5. Year of Business Establishment**

Range (date)	Baseline 2010-2015		Comparative 2021	
	Frequency	Percent	Frequency	Percent
1960 or earlier	33	11.4%	21	6.3%
1961-1980	31	10.7%	35	10.3%
1981-2000	100	34.5%	97	29.0%
2001-2010	96	33.1%	75	22.4%
2011-present	30	10.3%	107	32.0%
<b>Total</b>	<b>290</b>	<b>100.0%</b>	<b>335</b>	<b>100.0%</b>

Baseline N = 290, Comparative N = 335; Missing = 36

There was not a statistically significant difference (p-value=0.676) in marine reserve awareness between the baseline respondents and the 2021 respondents (Table 6). Among respondents who expressed an opinion, 47.8% of the respondents in the baseline studies were aware of the reserves and 45.9% of the 2021 respondents were aware of the reserves (Table 6). Florence, surveyed in 2015 and 2021, was the only community to show a significant change in marine reserves awareness over time (fisher exact p-value<0.001). The proportion of Florence business representatives that were not aware of the marine reserve decreased from 75.0% in the baseline study to 38.5% in the comparative study with more respondents being “not sure” in 2021 (Table 17, Appendix D).

**Table 6. Awareness of Marine Reserves**

Aware?	Baseline 2010-2015		Comparative 2021	
	Frequency	Percent	Frequency	Percent
Yes	153	47.8%	156	45.9%
No	157	49.1%	108	31.8%
Not Sure <sup>1</sup>	10	3.1%	76	22.4%
<b>Total</b>	<b>320</b>	<b>100.0%</b>	<b>340</b>	<b>100.1%</b>

N = 320; Missing = 0

<sup>1</sup>The 2010 and 2011 surveys did not allow for a “not sure” response.

To determine if perceived impact on business demand had changed over time, responses of “not sure” and “no change” were combined in the 2021 and 2014 and 2015 datasets. This was necessary because the surveys conducted in 2010 and 2011 were interviews with open-ended questions where responses of “not sure” and “no change” were combined into one neutral response category for analysis.

The perceived impact of marine reserves on business demand changed significantly between the baseline studies and comparative study (Table 7). By analyzing the contributions of each cell to the significant chi-square statistic, we found that the largest difference between the baseline and comparative studies was the proportion of respondents who stated that their business had decreased as a result of marine reserve implementation (Table 7A). The proportion of respondents who thought that their business would be negatively impacted decreased from 32.6% in the baseline studies to 1.5% in the comparative study (Table 7). Newport had the largest change in the proportion of respondents who reported negative perceived impacts, from 65.7% in 2011 to 1.1% in 2021. More than half of the respondents in all communities surveyed in 2021, except Depoe Bay (43.2%), reported being unsure of the impact marine reserves had on their business. Depoe Bay had the highest proportion of respondents who reported business had increased as a result of the marine reserves (13.5%). See Appendix D for more detailed information on each community.

**Table 7. Perceived Impacts on Business Demand**

Perceived Impact	Baseline (2010-2015)		Comparative (2021)	
	Frequency	Percent	Frequency	Percent
Business Increased	41	12.9%	29	8.5%
Business Decreased	104	32.6%	5	1.5%
No Change/Unsure <sup>1</sup>	174	54.5%	307	90%
<b>Total</b>	<b>319</b>	<b>100.0%</b>	<b>341</b>	<b>100.0%</b>

Baseline N = 319, Comparative = 341; Missing=1

$\chi^2 = 128.16$ , df= 2, p-value<0.001, N=660

<sup>1</sup>Surveys conducted in 2010 and 2011 were open-ended interviews where responses of “no change” and “unsure” were combined into a neutral response category.

**Table 7A. Relative Contribution to Chi Squared test Perceived Impact on Business**

Perceived Impact	Baseline Studies	Comparative Study
Business Increased	1.185%	1.108%
Business Decreased	39.003%	36.486%
No Change/Unsure	11.479%	10.739%

The response options on the 2014 and 2015 survey instrument and the 2021 survey instrument were the same, so they are compared separately from the 2010 and 2011 survey results (Table 8). As in the combined results above, there was a significant decrease ( $\chi^2 = 59.608$ , df = 3, p <0.001, n = 507) in the proportion of respondents who thought their business would decrease as a result of marine reserve



implementation between the baseline study (6.6%) and those that reported business had decreased in the current study (1.5%). The proportion of respondents who reported they were unsure of the impact the marine reserves had on their business more than doubled from 22.3% to 56.0% (Table 8). By analyzing the contributions of each cell to the significant chi-square statistic, we found that the largest difference between the 2014-15 baseline and comparative studies was in the proportion of respondents who were unsure how their business would be impacted by the marine reserve (Table 8A).

**Table 8. Perceived Impacts on Business Demand  
(2014 and 2015 baseline study to 2021 comparative study)**

Impact	Baseline 2014 and 2015		Comparative 2021	
	Frequency	Percent	Frequency	Percent
<b>Business Increased</b>	13	7.8%	29	8.5%
<b>Business Decreased</b>	11	6.6%	5	1.5%
<b>No Change</b>	105	63.3%	116	34.0%
<b>Unsure</b>	37	22.3%	191	56.0%
<b>Total</b>	166	100.0%	341	100.0%

Baseline N = 166, Comparative N = 341; Missing=0  
 $\chi^2 = 59.608$ , df = 3, p =  $7.13 \times 10^{-13}$ , n = 507

**Table 8A. Relative Contribution to Chi-squared Test of Perceived Impact on Business Demand - 2014 and 2015 baseline study to 2021 comparative study**

Perceived Impact	Baseline Studies	Comparative Study
<b>Business Increased</b>	0.069%	0.034%
<b>Business Decreased</b>	10.630%	5.175%
<b>No Change</b>	24.702%	12.025%
<b>Unsure</b>	31.858%	15.508%

An additional chi-square test was performed to determine if there was a significant difference in perceived business impacts between respondents who were aware and those who were not aware of the marine reserves (Table 9). Given the small (<5) number of responses for some cells, we also performed a Fisher's exact test, which is typically more appropriate for contingency table analysis with small samples. This comparison showed significantly different responses regarding perceived impacts to businesses between those who were aware of the marine reserves and those who were not ( $\chi^2 =$

40.037, df = 3,  $\chi^2$  p < 0.001, Fisher exact p < 0.001, N = 340). Respondents who were aware of the marine reserves were more likely to report that business had not changed or had increased as a result of the marine reserves (47.4% and 12.8%, respectively) compared to business representatives who were not aware of the reserves (22.8% and 4.3%). Businesses representatives that were not aware of the marine reserves were more likely to be unsure if their business had been impacted (71.7% compared to 37.8%)

**Table 9. Marine Reserves Awareness and Perceived Impact, 2021 Survey**

Impact	Aware		Not Aware	
	Frequency	Percent	Frequency	Percent
Business Increased	20	12.8%	8	4.3%
Business Decreased	3	1.9%	2	1.1%
No Change	74	47.4%	42	22.8%
Unsure	59	37.8%	132	71.7%
Total	156	99.9%	184	99.9%

N = 340; Missing=0

$\chi^2 = 40.037$ , df = 3,  $\chi^2$  p =  $1.047 \times 10^{-08}$ , Fisher exact p =  $2.778 \times 10^{-07}$ , N = 340

## CONCLUSIONS

A total of 341 business representative intercept interviews were conducted in Newport, Florence, Otter Rock, Lincoln City, Garibaldi, Depoe Bay, and Yachats in the summer of 2021. There were 320 responses to the baseline surveys conducted from 2010 through 2015. The largest proportion of responses came from Newport and Florence in both the combined baseline studies and the comparative 2021 study. Lincoln City had the largest change in response proportion, going from 9.1% of all surveys completed (n=29) in the baseline study to 22.0% (n=75) in 2021<sup>5</sup>.

Retail was the most common business sector represented in the responses for all survey years, and restaurants were the second most common business category represented in the 2014/2015 and 2021 studies. Visitor services was the second most common sector represented in surveys conducted in 2010 and 2011. Lodging and visitor services were the least common sectors represented in surveys conducted in 2014, 2015 and 2021. Lodging and restaurants were the least common sectors represented in the 2010 and 2011 surveys.

Business ownership was mostly local across all studies. Lincoln City had the lowest proportion of locally owned businesses in both the baseline and the current study. All business representatives contacted in Otter Rock represented locally owned businesses in the 2021 survey, but the Otter Rock sample was very small (n=3). Depoe Bay had the second highest proportion of locally owned businesses represented in the responses for the current survey and also had a much larger sample size (n=45). The proportion of respondents representing locally owned businesses increased in all towns across all survey years.

The baseline awareness of marine reserves among business representatives in Newport, Otter Rock, Lincoln City, Depoe Bay, Yachats, and Port Orford (surveyed in 2010 and 2011) was 57.5%. The baseline awareness of marine reserves among business representatives in Florence, Garibaldi, Depoe Bay, and Yachats (surveyed in 2014 and 2015) was 38.9%. The combined baseline awareness (2010 – 2015) was 47.8%. Awareness increased between the 2014/2015 study and 2021 study (45.9%), but the collective awareness across all communities never exceeded the awareness during the initial period of implementation of the pilot marine reserves. Florence was the only community that saw a significant increase in marine reserve awareness between the baseline and the 2021 surveys. Additionally, there was a significant difference in perceived marine reserve impact on business demand between those who reported being aware of the marine reserves and those who reported being unaware. Respondents who were aware of the marine reserves were more likely to say that business had increased as a result of the marine reserves or that there had been no change in business demand. Those who were not aware were more likely to be unsure of the impact marine reserves had on their business.

The perceived impact of marine reserves on business demand changed significantly between the baseline and current studies. The predominant trend was a decrease in negative perceived impacts and an increase in neutral perceived impacts. This trend holds whether the current study is compared to

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<sup>5</sup> The difference in response proportions reflects an intentional change to the sample design that targeted more tourism-oriented businesses.

the composite data of all baseline studies or just the 2014/2015 data where the sample design was most similar to the current study.

Every town where these surveys were conducted saw a significant change in perceived impact over time driven primarily by a decrease in perceived negative impacts and an increase in perceived neutral impacts. Changes in the number of respondents that perceived positive impacts to business demand were small, increasing slightly in some communities while decreasing slightly in others. The proportion of business representatives who reported positive impacts on business demand increased in Otter Rock, Lincoln City, Garibaldi, and Yachats. None of those communities had any respondents report negative impacts in the comparative survey. Yachats had the most dramatic change over time, with over two-thirds of respondents anticipating negative impacts from marine reserves in the first study, and no respondents indicating perceived negative impacts in the comparative study. Depoe Bay had the highest proportion (8.1%, n=3) of respondents who felt their business had decreased as a result of the marine reserves in the comparative study. Newport and Florence had small decreases in the proportion of respondents that perceived positive impacts between the baseline and comparative studies. Depoe Bay saw a decrease in the proportion of respondents with positive perceived impacts on business demand between 2010 and 2014, but an increase between 2014 and 2021.

All five marine reserves were implemented by 2016, so restrictions had been in place for at least five years, and up to nine years, prior to the 2021 survey. Roughly a third of business representatives contacted in 2021 were from businesses established between 2011 and 2021; substantially more newer businesses are represented in the 2021 study than in the baseline studies. These respondents all worked in businesses established after the first marine reserve restrictions were implemented. This is one possible explanation for the large increase in perceived neutral impacts, since many of these businesses have only operated in a post-marine reserve environment. A lack of controversy surrounding a policy that has already been implemented could be another explanation for the decrease in negative perceived impacts.

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**APPENDIX A**  
**2010 AND 2011 INTERVIEW QUESTIONNAIRE**

## Business Interview Questions

1. Are you locally owned? If not can you elaborate?
2. How many employees do you have on a regular basis? Does this increase seasonally and if so how?
3. What percent of your customers are local?
4. How long have you been in business?
5. What types of things attract people to this area of the coast?
6. Do you know about the marine reserves designated for the central coast area?
7. Do you think a marine reserve would have an impact on the number of visitors to this area? How?
8. Do you think a marine reserve would affect your business? How?
9. Did you know about the community groups focusing on these reserve areas? How would you like to see a group like this represent your position on the marine reserves?
10. Would you like more information about the marine reserves?
11. Would you like to comment on anything further?

**APPENDIX B**  
**2014 AND 2015 SURVEY INSTRUMENT**





## 2014/2015 ODFW MARINE RESERVES BUSINESS SURVEY

1. Please describe the ownership of this business (circle the correct letter)
  - a. Local (Go to question 3)
  - b. Non-local
  - c. Not sure/don't know
  
2. If this business is non-local, what is the type?
  - a. Corporate
  - b. Oregon ownership
  - c. Other \_\_\_\_\_
  
3. What year was this business established? \_\_\_\_\_
  
4. How many individuals work at this business?
  - a. Year-round full time \_\_\_\_\_
  - b. Year-round part time \_\_\_\_\_
  - c. Seasonal full time \_\_\_\_\_
  - d. Seasonal part time \_\_\_\_\_
  
5. What attracts visitors to this area? (circle all that apply)
  - a. Ocean/Beaches
  - b. Other scenic attractions
  - c. Fishing
  - d. Non-fishing outdoor activities
  - e. Low-density of people
  - f. Community atmosphere
  - g. Museums, aquariums, and other tourist attractions
  - h. Local breweries/beer
  - i. Other (please specify) \_\_\_\_\_

6. Which item on the previous list is most responsible for attracting visitors to the coast? (Write the corresponding letter from the previous list) \_\_\_\_\_
7. Were you aware that the state will be implementing a marine reserve in this area in 2016?
- a. Yes
  - b. No
  - c. Not sure

**A Marine Reserve (MR) is any area where you cannot remove or disturb any marine resource. Marine reserves were designated in this area to conserve habitats and biodiversity for future generations and to use the area for research of the near-shore environment. Marine reserves are still open to all non-extractive recreational activities, such as walking on**

8. Do you think the marine reserves will impact the number of visitors to this area?
- a. The number of visitors will increase
  - b. The number of visitors will decrease
  - c. There will be no change
  - d. Not sure
9. Do you think a marine reserve would affect your business?
- a. Business will increase
  - b. Business will decrease
  - c. There will be no change
  - d. Not sure

10. Thank you for participating in our survey, your cooperation will help ODFW. Would you like to comment on anything further?

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ODFW USE ONLY	
1. ID No. _____	4. Location _____
2. Date _____	5. Business Sector _____
3. Time _____	6. Size _____
4.	

**APPENDIX C**  
**2021 SURVEY INSTRUMENT**

# ODFW MARINE RESERVES BUSINESS SURVEY



**1. Please describe the ownership of this business (circle the correct letter)**

- a. Local owned (coastal Oregon)
- b. Non-coastal Oregon owned
- c. Not Oregon owned (other state or internationally owned)
- d. Not sure/don't know

**2. What year was this business established?**

- a. 1960 or earlier
- b. 1961 – 1980
- c. 1981 – 2000
- d. 2001 – 2010
- e. 2011 – present

**3. Were you aware that the state implemented a marine reserve in this area?**

- a. Yes
- b. No
- c. Not sure

**4. Do you think the marine reserve has affected your business?**

- a. Business has increased because of the marine reserve
- b. Business has decreased because of the marine reserve
- c. There has been no change because of the marine reserve
- d. Not sure

**Do you have any observations about the marine reserves that you would like to share?**

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ODFW USE ONLY	
5. ID No. _____	4. Location _____
6. Date _____	5. Business Sector _____
7. Time _____	6. Size _____
8.	

**APPENDIX D**  
**ADDITIONAL COMMENTS FROM RESPONDENTS**

As part of the surveys, respondents were asked if there were any subsequent comments they would like to make. This list includes all additional comments made during the studies.

### **Additional Comments from the Baseline Studies**

1. Advertise (poster) on fishing regulations around town and where they can purchase a license
2. Concerned about the difference and treatment of commercial fishermen and charter and sportsfishermen
3. Concerned with how it affects locals
4. Does not reflect the views of the owner, person who filled out survey was upset about not being able to take agates at Otter
5. Generally a good job. Some term of open season appears not be thought out to work along with businesses. Etc.
6. History will prove this was a mistake
7. Keep the fishing open, and going strong it feeds our education, our kids, and our future
8. Keep up the good work!
9. Long term I believe marine reserves will increase quality of marine habitat which will indirectly contribute to wildlife viewing and enhance our business
10. Marine reserves need to be governed more by the local fishermen who know the coastal waters rather than by government dictating terms
11. Need to publicize, we live here and didn't hear about it
12. Thanks
13. Thanks for what you're doing
14. Too many restrictions
15. Yes, very dramatically make it harder, was the hardest saddest thing the MR team have ever done
16. You should consult fishermen about where they think they should be put. We know more from experience
17. Reserves are important; we need to keep things untouched, need to protect our own resources
18. Great idea!
19. Always good to have balance, ODFW does a good job
20. Good thing, Awesome!
21. Good thing, doesn't like the current permit situation
22. Thanks for asking my opinion.
23. Let's wait and see
24. We have to ensure that food is adequate in the future
25. We want to preserve the resource - want to create another generation of sportsman. Management would have to be taught and have done well.
26. When we went into the reserves, I was anti, now I'm open eyed with curiosity. Doubt it will help. There are too many agendas flying, but we haven't seen any proof that this approach works. The rebuilding of the stocks is pretty phenomenal. Fishermen give a damn. The decision shoved us through a keyhole. Natural resource based business drives the economy on the OR coast.

27. There is a tug of war between community members and environmentalists What are benefits? Where does the \$ come from for the research? Will there be a sunset date on the reserves? How will data be shared? Already have reserves on the coast-don't know about any current research. They just want to shut down the ocean.
28. Great rockpile of nearshore boats. Boat owners, business partners are all interested and want to be a part of the decision making.
29. More information needs to become available to public and surrounding area. Only heard from 1 side. Need honest information not bureaucratic. The fishing fleet needs to be better represented
30. Customers would like more info because they are generally conservation-minded.
31. Sounds like a nice idea for the environment
32. Don't shut down the industry
33. Most people who are looking for second homes fish further out
34. More accurate research needs to be done to monitor fish populations
35. The marine reserves are a great idea. They will help the area in general
36. Marine reserves are a great idea and I'm in support
37. In the long run, its good
38. You're doing a good job.
39. Good luck!
40. I would like more information

### **Additional Comments from the Comparative Study**

1. Happy you are out here!
2. Pretty.
3. Keep up the good work! We love our lake.
4. Not really any at all.
5. Keep doing what you are doing.
6. We are new just opened June 18, 2021
7. I think it's awesome.
8. Needs more advertising.
9. Our central coast has no reefs' therefore it is insignificant.
10. I think the reserve is a positive thing and promotes different types of tourism.
11. Love, would like more signs telling people what they can see.
12. Glad to see this step taken-good luck.
13. I do not have any observations.
14. It is more scenic and provides space for wildlife which we all enjoy!
15. Salmon River estuary is not a safe place to fish crab lots of accidents but we have a lot of tourist here and any open space along the beach for surf fish would help.
16. I'm not sure what the marine reserves.
17. Keep up the good work
18. None:) we like animals
19. I haven't noticed anything:)
20. I hope it is a success and we get rid of plastic.
21. Love them!
22. None I can think of. Glad we have them!
23. Need more Information
24. I think marine reserves are awesome.

25. Don't know.
26. No just questions-What is that? What does it mean?
27. Marine reserves here hurt and destroy the livelihoods of fisherman, fish buyers, plant workers, business owners, restaurant owners and their employees. Our industries here are already sustainable.
28. I'm glad we protect our wet lands and beaches.
29. I'm not 100% sure where the reserves are, or even where to find most information regarding that. Most likely online?
30. I think it's a great thing for the community. Hopefully the tidepools will be full of sea creatures again. Tourists love that.
31. Have an animal lottery permitting the taking of 3 fish of any species.
32. Doing a good job.
33. So necessary for life on the coast!
34. Being here in 3 yrs a local. Don't know much of marine reserves history on coast and Depoe Bay.
35. Would like to see Otter Rock area expanded!
36. Maybe more signage in the highway.
37. More awareness.
38. I think it is a good program.
39. Please make sure our visitor center has some written educational material.
40. This has drawn a lot of visitors to the area to observe nature.
41. We find the marine reserves essential - super important.
42. Local friend is employed by the Cape Perpetua Tide Pool Ambassador. Glad they are doing this!
43. Thank you!
44. We appreciate the pro-active duty of protecting our land and waters.
45. Make more reserves
46. Grateful that we have them!
47. Happy about them!



**APPENDIX E**  
**2021 RESULTS BY COMMUNITY**

## Newport

### Ownership

To ascertain if there was a change in reported local ownership among respondents to the baseline and current business surveys, Table 10 includes a comparison of Newport ownership responses from the 2011 baseline and 2021 comparative survey. The proportion of locally owned businesses increased from 79.1% in the 2011 to 96.7% in the 2021. It should be noted that the 2011 survey was a stratified sample that included more business types, whereas the 2021 survey specifically targeted businesses that might be more impacted by changes in tourism. Managers in the large “big box” chain stores and other unrelated businesses were not contacted in the 2021 survey. This outcome reflects that intentional change in the sample design.

**Table 10. Business Ownership in Newport**

Ownership	Baseline 2011		Comparative 2021	
	Frequency	Percent	Frequency	Percent
Local	53	79.1%	89	96.7%
Non-Local	14	20.9%	2	2.2%
Not Sure	N/A	N/A	1	1.1%
Total	67	100.0%	92	100.0%

Baseline n=67, Comparative n=92; Missing=0

Note: A “Not Sure” response was not an option on the 2010/2011 survey.

### Year Business Established

Table 11 is a comparison to determine if there had been a change in the age of businesses between the 2010 baseline survey and the 2021 comparison survey. The open-ended earlier question data were recoded for this comparison. As might be expected, the largest changes were among those businesses established between 1961 and 1980, which decreased by 4.5%, and those established prior to 1961, which decreased by 7.3% (Table 11).

**Table 11. Year of Business Establishment in Newport**

Range	Baseline 2011		Comparative 2021	
	Frequency	Percent	Frequency	Percent
1960 or earlier	7	10.6%	3	3.3%
1961-1980	8	12.1%	7	7.6%
1981-2000	29	43.9%	30	32.6%
2001-2010	22	33.3%	26	28.3%
2011- present	N/A	N/A	26	28.3%
Total	66	99.9%	92	100.1%

Baseline n=66, Comparative n=92; Missing=0

### **Awareness of Marine Reserves**

To compare reported awareness between the baseline and current studies, the options of “no” and “unsure” were combined into one category. This was necessary because respondents to the 2010 survey could not choose the unsure response category.

There was not a significant change in marine reserves awareness among the Newport respondents between the baseline study in 2010/2011 and the 2021 study (p-value=0.8117, n = 159). Awareness varied only slightly, from 47.8% (baseline) to 44.6% (2021).

### **Perceived Impact on Business Demand**

To determine if there had been a change in perceived impact on business demand between the 2010 and 2021 surveys the response categories of “no change” and “not sure” were combined to allow statistical comparison. This was necessary because respondents to the 2010 survey could not choose that business would not change.

There was a significant change in perceived impact of marine reserves on business demand between the baseline survey and the 2021 survey ( $\chi^2= 102.02$ ,  $df= 2$ ,  $p\text{-value}= 2.2 \times 10^{-16}$ ,  $n= 159$ ). This was primarily driven by fewer respondents reporting a decrease in business as a result of the marine reserves. In the baseline study, 65.7% of the respondents reported they felt their business would be negatively impacted compared to 1.1% who reported business had decreased in 2021 (Table 12). There was also a large increase in the proportion of business representatives that reported no change in business as a result of the marine reserves, from 11.9% in 2010/2011 to 32.6% in 2021. Analysis of the contributions of each cell to the significant chi-square statistic found that the reduction in the proportion of respondents who felt their business would be negatively impacted by the marine reserve was the largest difference between the baseline and comparative studies was (Table 12A).

**Table 12. Perceived Impact of Marine Reserves on Business Demand among Newport Respondents**

Impact	Baseline 2011		Comparative 2021	
	Frequency	Percent	Frequency	Percent
Business Increased	15	22.4%	9	9.8%
Business Decreased	44	65.7%	1	1.1%
No change/ not sure <sup>1</sup>	8	11.9%	82	89.1%
<b>Total</b>	<b>67</b>	<b>100.0%</b>	<b>92</b>	<b>100.0%</b>

Baseline n=67, Comparative n=159, Missing=0  
 $\chi^2 = 102.02$ , df= 2, p-value=  $2.2 \times 10^{-16}$ , n= 159

<sup>1</sup> Surveys conducted in 2010 and 2011 were open-ended interviews where responses of “no change” and “unsure” were combined into a neutral response category.

**Table 12A. Newport Impact Chi Square Contribution**

<u>Impact</u>	<u>Baseline</u>	<u>Current</u>
<u>Business increased</u>	<u>2.314</u>	<u>1.686</u>
<u>Business decreased</u>	<u>32.404</u>	<u>23.598</u>
<u>Business did not change/ not sure</u>	<u>23.143</u>	<u>16.854</u>

## Florence

### Ownership

Respondents were asked to characterize the ownership of the business as local, non-local, or they could choose that they were unsure. The 2021 survey targeted businesses that would be most reliant on tourism, and managers of “big-box” stores, chain restaurants, and other unrelated businesses were not contacted. The largest change was in the proportion of non-local responses, which decreased from 21.3% in 2015 to 9.1% in 2021 (Table 13).

**Table 13. Business Ownership in Florence**

Ownership	Baseline 2015		Comparative 2021	
	Frequency	Percent	Frequency	Percent
Local	62	77.5%	68	88.3%
Non-Local	17	21.3%	7	9.1%
Not Sure	1	1.3%	2	2.6%
<b>Total</b>	<b>80</b>	<b>100.1%</b>	<b>77</b>	<b>100.0%</b>

Baseline n=80, Comparative n=77, Missing=1

### Year Business Established

The 2015 survey question asked respondents to write in the year the business was established while the 2021 survey used a multiple-choice question. The largest change concerning the year the businesses were established in Florence was in the 1960 and earlier category, which decreased from 13.2% in the baseline data to 6.4% in the current study (Table 14).

**Table 14. Year of Business Establishment in Florence**

Range	Baseline 2015		Comparative 2021	
	Frequency	Percent	Frequency	Percent
1960 or earlier	9	13.2%	5	6.4%
1961-1980	4	5.9%	7	9.0%
1981-2000	20	29.4%	21	26.9%
2001-2010	20	29.4%	22	28.2%
2011- present	15	22.1%	23	29.5%
<b>Total</b>	<b>68</b>	<b>100.1%</b>	<b>78</b>	<b>100.0%</b>

Baseline n=68, Comparative n=78; Missing=12

**Awareness of Marine Reserves**

The change in marine reserves awareness among respondents in Florence was statistically significant (Table 15). The proportion of business representatives that were not aware of the marine reserve decreased significantly from the baseline study (75.0%) to the current study (38.5%, fisher exact p-value<0.001). There was also a large increase in the proportion of business representatives that were unsure if they were aware of the marine reserves, 3.8% in the baseline study to 24.4% in the comparative study. The contribution of each response category to the chi-square test is summarized in Table 15A and shows that changes in the frequency of no and unsure responses are primarily responsible for the significance. It should be noted that the 2015 survey included a description of what a marine reserve is and what types of activities are allowed and prohibited with that designation.

**Table 15. Awareness of Marine Reserves among Florence Respondents**

Awareness	Baseline Awareness 2015		Comparative Awareness 2021	
	Frequency	Percent	Frequency	Percent
Yes	17	21.3%	29	37.2%
No	60	75.0%	30	38.5%
Unsure	3	3.8%	19	24.4%
Total	80	100.1%	78	100.1%

Baseline n=80, Comparative n=78; Missing=0

$\chi^2=24.745$ , df= 2,  $\chi^2$  p-value=  $4.232 \times 10^{-06}$ , fisher exact p-value=  $2.507 \times 10^{-06}$ , n= 158

**Table 15A. Florence Awareness Chi Square Contribution**

Aware	Baseline	Comparative
Yes	6.867%	7.043%
No	18.467%	18.940%
Unsure	24.033%	24.650%

## Perceived Impact on Business

There was statistically significant change in perceived impact on business demand among respondents in Florence between 2015 and 2021 (Table 16). The largest change was an increase among those who indicated they were “not-sure” if their business had been impacted by marine reserve implementation. In the baseline study, 22.8% said they were unsure, while 60.3% chose this option in 2021. The proportion of respondents who reported no change in business demand decreased from 69.6% in 2015 to 35.9% in 2021. By analyzing the contributions of each cell to the significant chi-square statistic, we found that the largest difference between the baseline and comparative study was the proportion of respondents who were unsure how marine reserves would impact demand for their business (Table 16A).

**Table 16. Perceived Impact on Business Demand among Florence Respondents**

Impact	Baseline Impact 2015		Comparative Impact 2021	
	Frequency	Percent	Frequency	Percent
Business Increased	6	7.6%	2	2.6%
Business Decreased	0	0.0%	1	1.3%
No change	55	69.6%	28	35.9%
Not sure	18	22.8%	47	60.3%
<b>Total</b>	79	100.0%	78	100.1%

Baseline n=79, Comparative n=78; Missing=1

$\chi^2=24.716$ ,  $df=3$ ,  $\chi^2$  p-value= $1.77 \times 10^{-6}$ , fisher exact p-value= $3.148 \times 10^{-6}$ , n=157

**Table 16A. Florence Impact Chi Square Contribution**

Impact	Baseline	Comparative
Business increased	3.919	3.969
Business decreased	2.036	2.062
Business did not change	16.971	17.188
Unsure	26.756	27.099

## Otter Rock

### Ownership

Otter Rock had the smallest sample size across both the baseline and comparative study (n=7 in 2011 and n=3 in 2021). Well over half of businesses surveyed in 2011 were locally owned and 100.0% of businesses surveyed in 2021 were locally owned (Table 17).

**Table 17. Business Ownership in Otter Rock**

Ownership	Baseline 2011		Comparative 2021	
	Frequency	Percent	Frequency	Percent
Local	4	57.1%	3	100.0%
Non-Local	3	42.9%	0	0.0%
Not Sure <sup>1</sup>	N/A	N/A	0	0.0%
<b>Total</b>	<b>7</b>	<b>100.0%</b>	<b>3</b>	<b>100.0%</b>

Baseline n=7, Comparative n=3; Missing=0

<sup>1</sup>The “Not Sure” option was not available on the 2010/2011 survey.

### Year Business Established

The largest proportion (42.9%) of businesses contacted in 2011 were established between 1961 and 1980. All business in the 2021 survey were established in 1981 or later (Table 18).

**Table 18. Year of Business Establishment in Otter Rock**

Range	Baseline 2011		Comparative 2021	
	Frequency	Percent	Frequency	Percent
1960 or earlier	1	14.3%	0	0.0%
1961-1980	3	42.9%	0	0.0%
1981-2000	1	14.3%	2	66.6%
2001-2010	2	28.6%	0	0.0%
2011- present	N/A	N/A	1	33.3%
<b>Total</b>	<b>7</b>	<b>100.1%</b>	<b>3</b>	

Baseline n=7, Comparative n=3; Missing=0



**Awareness of Marine Reserves**

Awareness was consistently high between the two studies, 71.4% in 2010/2011 and 100.0% in 2021 (Table 19).

**Table 19. Awareness of Marine Reserves Among Otter Rock Respondents**

Awareness	Baseline Awareness 2010/2011		Comparative Awareness	
	Frequency	Percent	Frequency	Percent
Yes	5	71.4%	3	100.0%
No	2	28.6%	0	0%
Unsure	N/A	N/A	0	0%
<b>Total</b>	<b>7</b>	<b>100.0%</b>	<b>3</b>	<b>100.0%</b>

Baseline n=7, Comparative n=3; Missing=0

**Perceived Impact on Business**

No respondents reported a decrease in business as a result of the marine reserves at Otter Rock in 2021 compared to 57.1% who thought business would decrease in 2011 (Table 20).

**Table 20. Perceived Impact on Business Demand in Otter Rock**

Impact	Baseline Impact 2011		Comparative Impact	
	Frequency	Percent	Frequency	Percent
Business Increased	2	28.6%	1	33.3%
Business Decreased	4	57.1%	0	0%
No change <sup>1</sup>	1	14.3%	2	66.7%
<b>Total</b>	<b>7</b>	<b>100.0%</b>	<b>3</b>	<b>100.0%</b>

Baseline n=7, Comparative n=3; Missing=0

<sup>1</sup> Surveys conducted in 2010 and 2011 were open-ended interviews where responses of “no change” and “unsure” were combined into a neutral response category.

# Lincoln City

## Ownership

To determine the proportion of locally owned businesses, respondents in 2010 were asked an open-ended question, while in 2021 they responded to a multiple-choice question. Table 21 shows the frequency and proportion of locally and non-locally owned businesses in Lincoln City. The proportion of locally owned businesses increased from 55.2% in the baseline study to 76.7% in the comparative study. Likewise, the proportion of non-locally owned business decreased from 44.8% in the baseline to 19.2% in the comparative study. This change is indicative of an intentional change to the study design, see page 4.

**Table 21. Business Ownership in Lincoln City**

Ownership	Baseline 2010		Comparative 2021	
	Frequency	Percent	Frequency	Percent
Local	16	55.2%	56	76.7%
Non-Local	13	44.8%	14	19.2%
Not Sure <sup>1</sup>	N/A	N/A	3	4.1%
Total	29	100.0%	73	100.0%

Baseline n=29, Comparative n=73; Missing=2

<sup>1</sup>The “Not Sure” option was not available on the 2010/2011 survey.

### Year Business Established

The majority of businesses in both the 2010/2011 survey and the 2021 survey were established after 1980, 75.0% in 2010/2011 and 73.0% in 2021 (Table 22).

**Table 22. Year of Business Establishment in Lincoln City**

Range	Baseline 2010		Comparative 2021	
	Frequency	Percent	Frequency	Percent
1960 or earlier	3	10.7%	7	9.5%
1961-1980	4	14.3%	13	17.6%
1981-2000	10	35.7%	22	29.7%
2001-2010	11	39.3%	13	17.6%
2011- present	N/A	N/A	19	25.7%
Total	28	100.0%	74	100.1%

Baseline n=28, Comparative n=74; Missing=2

### Awareness of Marine Reserves

To investigate change in awareness of the marine reserves among Lincoln City respondents, some earlier responses were recoded. Because the “unsure” option was not available on the 2010 survey, responses of “unsure” and “not aware” were combined prior to performing statistical comparison between the baseline and 2021 comparative study data. The changes in marine reserve awareness were not significant in Lincoln City between 2010 and 2021 (p-value= 0.6225). Awareness of the reserves ranged from 48.3% (baseline) to 40.5% (2021) among the respondents.

### Perceived Impact on Business

Similarly, for a question concerning perceived impacts on business demand, the responses “not sure” and “no change” were combined into a single response category (Table 23). A statistical comparison of those responses indicated that there was a significant change in perceived impact on business demand between the baseline and current studies (fisher exact p-value<0.001, n=104). Analysis of the contributions of each cell to the significant chi-square statistic found that the largest difference between the baseline and comparative study was the large decrease in the proportion of respondents who felt that their business was negatively impacted by marine reserves (Table 23A).

None of the 2021 respondents in Lincoln City thought there was a decrease in their business demand as a result of the marine reserves compared to 62.1% who thought business demand would decrease

in the baseline study. The proportion of respondents that reported business increased as a result of the marine reserves nearly doubled from 3.4% to 6.7% (Table 23).

**Table 23. Perceived Impact on Business Demand in Lincoln City**

Impact	Baseline Impact 2010		Comparative Impact 2021	
	Frequency	Percent	Frequency	Percent
Business Increased	1	3.4%	5	6.7%
Business Decreased	18	62.1%	0	0%
No change/unsure <sup>1</sup>	10	34.5%	70	93.3%
<b>Total</b>	<b>29</b>	<b>100.0%</b>	<b>75</b>	<b>100.0%</b>

Baseline n=29, Comparative n=75; Missing=0

$\chi^2=56.343$ ,  $df=2$ ,  $\chi^2$  p-value=  $5.824 \times 10^{-13}$ , fisher exact p-value=  $4.824 \times 10^{-13}$ , n=104

<sup>1</sup> Surveys conducted in 2010 and 2011 were open-ended interviews where responses of “no change” and “unsure” were combined into a neutral response category.

**Table 23A. Lincoln City Chi Square Contribution Table**

Impact	Baseline	Current
Business increased	0.481	0.186
Business decreased	59.583	23.039
Business did not change/unsure	12.052	4.660

## Garibaldi

### Ownership

The vast majority of business in Garibaldi were locally owned in the 2014 survey (86.4%) as well as in the 2021 survey (90.0%; Table 24).

**Table 24. Business Ownership in Garibaldi**

Ownership	Baseline 2014		Comparative 2021	
	Frequency	Percent	Frequency	Percent
Local	19	86.4%	18	90.0%
Non-Local	3	13.6%	2	10.0%
Not Sure	0	0.0%	0	0.0%
<b>Total</b>	<b>22</b>	<b>100.0%</b>	<b>20</b>	<b>100.0%</b>

Baseline n=22, Comparative n=20; Missing=1

### **Year Business Established**

The majority of businesses in Garibaldi were established after 2000, 60.0% in the baseline survey and 70.0% in the 2021 survey (Table 25).

**Table 25. Year of Business Establishment in Garibaldi**

Range	Baseline 2014		Comparative 2021	
	Frequency	Percent	Frequency	Percent
1960 or earlier	3	15.0%	0	0.0%
1961-1980	1	5.0%	2	10.0%
1981-2000	4	20.0%	4	20.0%
2001-2010	7	35.0%	4	20.0%
2011- present	5	25.0%	10	50.0%
<b>Total</b>	<b>20</b>	<b>100.0%</b>	<b>20</b>	<b>100.0%</b>

Baseline n=20, Comparative n=20; Missing=3

### Awareness of Marine Reserves

The proportion of respondents in Garibaldi that were aware of marine reserves increased slightly from 40.9% to 42.9%. There was also a slight decrease in those that reported not being aware of the marine reserves, and a 14.3% increase in those that reported they were unsure if they were aware or not. These variations in response across the studies were not significant (fisher exact p-value=0.2106).

### Perceived Impact on Business

There was a significant change in the perceived impact of marine reserves on business demand among Garibaldi respondents between the baseline and the current study (Table 26). The proportion respondents who reported they unsure of the impact marine reserve implementation had on business demand nearly tripled from 18.2% in the baseline study in 2014 to 52.4% in 2021 ( $\chi^2=8.772$ ,  $df=3$ ,  $\chi^2$  p-value=0.03248, fisher exact p-value=0.01944, n=43). The proportion of those who felt business had increased as a result of the marine reserve more than doubled from 4.5% in 2014 to 9.5% in 2021. No respondents reported a decrease in business demand as a result of the marine reserves in 2021 compared to 18.2% who anticipated a decrease in business demand in the baseline study.

**Table 26. Perceived Impact on Business Demand in Garibaldi**

Impact	Baseline Impact 2014		Comparative Impact 2021	
	Frequency	Percent	Frequency	Percent
<b>Business Increased</b>	1	4.5%	2	9.5%
<b>Business Decreased</b>	4	18.2%	0	0%
<b>No change</b>	13	59.1%	8	38.1%
<b>Not sure</b>	4	18.2%	11	52.4%
<b>Total</b>	22	100.0%	21	100.0%

Baseline N=22, Comparative N=21; Missing=0  
 $\chi^2=8.772$ ,  $df=3$ ,  $\chi^2$  p-value=0.03248, fisher exact p-value=0.01944, n=43

## Depoe Bay

**Ownership**

The proportion respondents who stated their business was locally owned in Depoe Bay increased consistently between the 2010 and 2014 baseline surveys, and the 2021 comparative survey. By 2021 nearly all (97.3%) business representatives reported their businesses were locally owned (Table 27).

**Table 27. Combined Table of Business Ownership in Depoe Bay**

Ownership	Baseline 2010		Baseline 2014		Comparative 2021	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
<b>Local</b>	10	62.5%	24	82.8%	36	97.3%
<b>Non-Local</b>	6	37.5%	3	10.3%	1	2.7%
<b>Not Sure<sup>1</sup></b>	N/A	N/A	2	6.9%	0	0.0%
<b>Total</b>	16	100.0%	29	100.0%	37	100.0%

2010 Baseline n=16, 2014 Baseline n=29, Comparative n=37; Missing=0

<sup>1</sup>The “Not Sure” option was not available on the 2010/2011 survey.

**Year Business Established**

The number of businesses that respondents said were established in 1960 or earlier remained the same in all survey years (3). The proportion of respondents who indicated their businesses were established after 2000 increased to more than half (54.6%) of the 2021 survey respondents (Table 28).

**Table 28. Year of Business Establishment in Depoe Bay**

Range	Baseline 2010, 2014		Comparative 2021	
	Frequency	Percent	Frequency	Percent
<b>1960 or earlier</b>	6	15.0%	3	9.1%
<b>1961-1980</b>	6	15.0%	5	15.2%
<b>1981-2000</b>	11	27.5%%	7	21.2%
<b>2001-2010</b>	10	25.0%%	2	6.1%
<b>2011- present</b>	7	17.5%	16	48.5%
<b>Total</b>	40	100.0%	33	100.1%

Baseline n=40, Comparative n=33; Missing=9

**Awareness of Marine Reserves**

There was not a significant change in awareness in Depoe Bay between the baseline surveys conducted in 2010 and 2014 and the comparative survey conducted in 2021 (p-value=0.751). Among the respondents in Depoe Bay, awareness of the reserves in Depoe Bay ranged from 62.5% (2010) to 58.6% (2014) to 54.1% (2021).

**Perceived Impact on Business**

There was a significant change in perceived business impacts among Depoe Bay respondents between the baseline study and the comparative survey (Table 29). The proportion of respondents who thought business would decrease if marine reserves were implemented decreased from 36.6% in the baseline studies to 8.1% in the 2021 study (fisher exact p-value=0.01267). By analyzing the contributions of each cell to the significant chi-square statistic, we found that the largest difference between the baseline and comparative study was the large decrease in the proportion of respondents who felt that their business was negatively impacted by marine reserves (Table 29A).

**Table 29. Combined Perceived Impact on Business Demand in Depoe Bay**

Impact	Baseline Impact 2010, 2014		Comparative Impact 2021	
	Frequency	Percent	Frequency	Percent
Business Increased	5	11.1%	5	13.5%
Business Decreased	16	35.6%	3	8.1%
No change/ unsure <sup>1</sup>	24	53.4%	29	78.3%
Total	45	100.1%	37	99.9%

Baseline n=45, Comparative n=37; Missing=0

$\chi^2=8.6685$ , df= 2, chi-square p-value=0.01311, fisher exact p-value=0.01267, n=82

<sup>1</sup> Surveys conducted in 2010 and 2011 were open-ended interviews where responses of “no change” and “unsure” were combined into a neutral response category.

**Table 29A. Depoe Impact Chi Square Contribution**

Impact	Baseline	Comparative
Business increased	0.500%	0.608%
Business decreased	34.365%	41.795%
Business did not change/ unsure	10.257%	12.475%



## Yachats

### Ownership

Ownership remained consistent across all survey years in Yachats with 87.5% to 88.6% of businesses being locally owned (Table 30). No respondents reported being unsure of the ownership in the baseline studies, while the proportion of those who reported being non-local and those being unsure was nearly equal, 5.8% and 5.7% respectively, in 2021.

**Table 30. Combined Table of Business Ownership in Yachats**

Ownership	Baseline 2010, 2014		Comparative 2021	
	Frequency	Percent	Frequency	Percent
Local	45	87.5%	31	88.6%
Non-Local	6	12.5%	2	5.8%
Not Sure <sup>1</sup>	0	0%	2	5.7%
<b>Total</b>	<b>51</b>	<b>100.0%</b>	<b>35</b>	<b>100.1%</b>

Baseline n=51, Comparative n=35; Missing=0

<sup>1</sup>The “Not Sure” option was not available on the 2010/2011 survey.

### Year Business Established

More than 85% of businesses in all survey years were established in 1981 or later (Table 31).

**Table 31. Year of Business Establishment in Yachats**

	Baseline 2010, 2014		Current 2021	
	Frequency	Percent	Frequency	Percent
1960 or earlier	2	4.7%	3	8.6%
1961-1980	4	9.3%	1	2.9%
1981-2000	19	44.2%	11	31.4%
2001-2010	15	34.9%	8	22.9%
2011- present	3	7.0%	12	34.3%
<b>Total</b>	<b>43</b>	<b>100.1%</b>	<b>35</b>	<b>100.1%</b>

Baseline n=43, Comparative n=35; Missing=8

**Awareness of Marine Reserves**

The response categories of “no” and “unsure” were combined in all survey years so the baseline data could be compared to the 2021 survey. A chi-square test showed that there was not a significant change in awareness among Yachats respondents between the baseline studies and 2021 study (p-value= 0.7439). Among the respondents in Yachats, awareness of the reserves ranged from 62.5% (2010) to 62.9% (2014) to 68.4% (2021).

**Perceived Impact on Business**

The majority (68.8%) of business representatives contacted in 2010 anticipated that business would decrease if marine reserves were implemented. That proportion decreased to 2.9% in 2014. This resulted in a combined proportion of respondents who reported demand for their business would decrease in the baseline studies of 23.5% (Table 32). No respondents reported a decrease in business demand as a result of the marine reserve in 2021. The proportion of respondents who felt business would increase as a result of the marine reserves increased from 9.8% in the baseline studies to 14.3% in 2021 survey.

**Table 32. Combine Perceived Impact on Business Demand in Yachats**

Impact	Baseline Impact 2010, 2014		Comparative Impact 2021	
	Frequency	Percent	Frequency	Percent
Business Increased	5	9.8%	5	14.3%
Business Decreased	12	23.5%	0	0%
No change/ unsure <sup>1</sup>	34	66.7%	30	85.7%
<b>Total</b>	51	100.0%	35	100.0%

Baseline n=51, Comparative n=35; Missing=0

$\chi^2=9.6057$ ,  $df=2$ ,  $\chi^2$  p-value=0.008206, fisher exact p-value=0.003797, n=86

<sup>1</sup> Surveys conducted in 2010 and 2011 were open-ended interviews where responses of “no change” and “unsure” were combined into a neutral response category.