

# Ramsey Harbour Invasive Species Survey 2022

*Semi-quantitative estimate of abundance of Austrominius modestus*



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## Introduction

The survey was conducted on 4<sup>th</sup> September 2022, at low water, by Dr Lara Howe, Marine Conservation Officer and volunteers. Only the south side of the south wall was surveyed, as in the previous years.

## Methods

All methods followed the previous year's survey methodologies (See Appendix).



Figure 1. Positions of the four survey points along the southern wall.

Site 1: The top of the pier, at the 3<sup>rd</sup> pillar down.

Site 2: The promontory to the right of the last pillar.

Site 3: 20 rectangular blocks to the right of site 2.

Site 4: The end of the pier, immediately prior to the stepped section.

## Results

### 2022 results

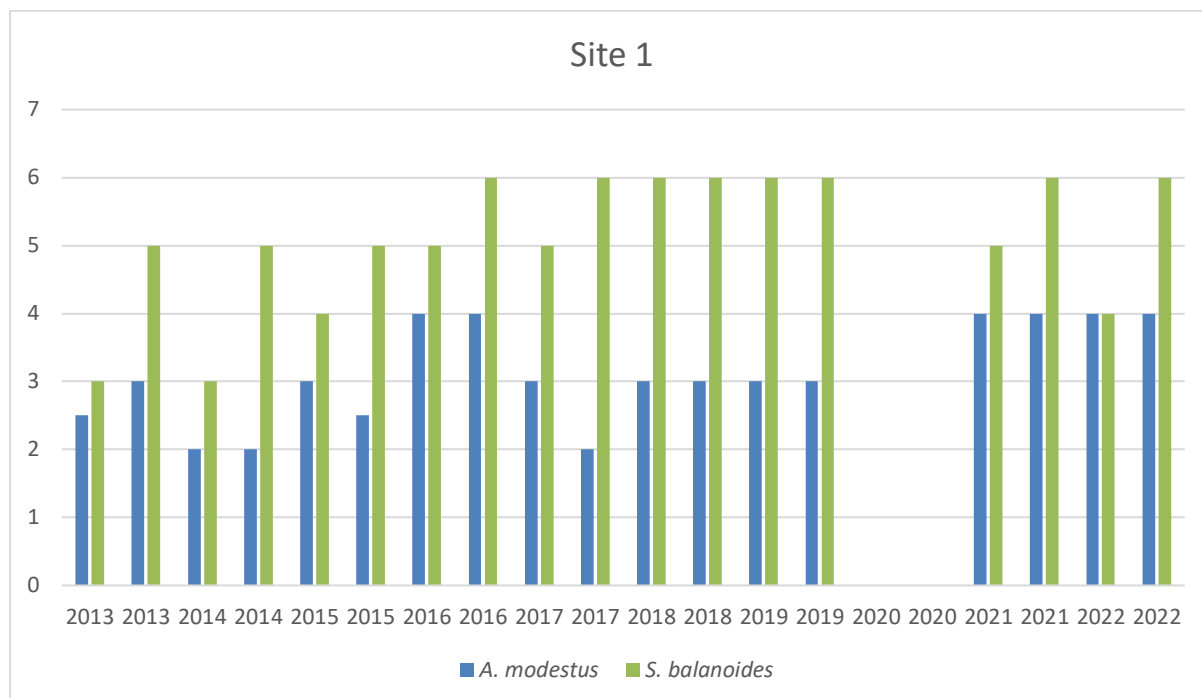
<i>Species</i>	Site 1		Site 2			Site 3			Site 4			
	VH	H	VH	H	M	VH	H	M	VH	H	M	L
<i>A. modestus</i>	C	C	C	A	C	A	C	F	A	A	F	O
<i>S. balanoides</i>	A	SA	C	A	A	A	A	A	SA	A	A	C
<i>C. gigas</i>	N	N	N	N	N	N	N	N	N	N	N	N
<i>M. edulis</i>	N	N	N	N	N	N	N	N	N	N	N	N

Table 1. Results of the invasive species survey 2021.

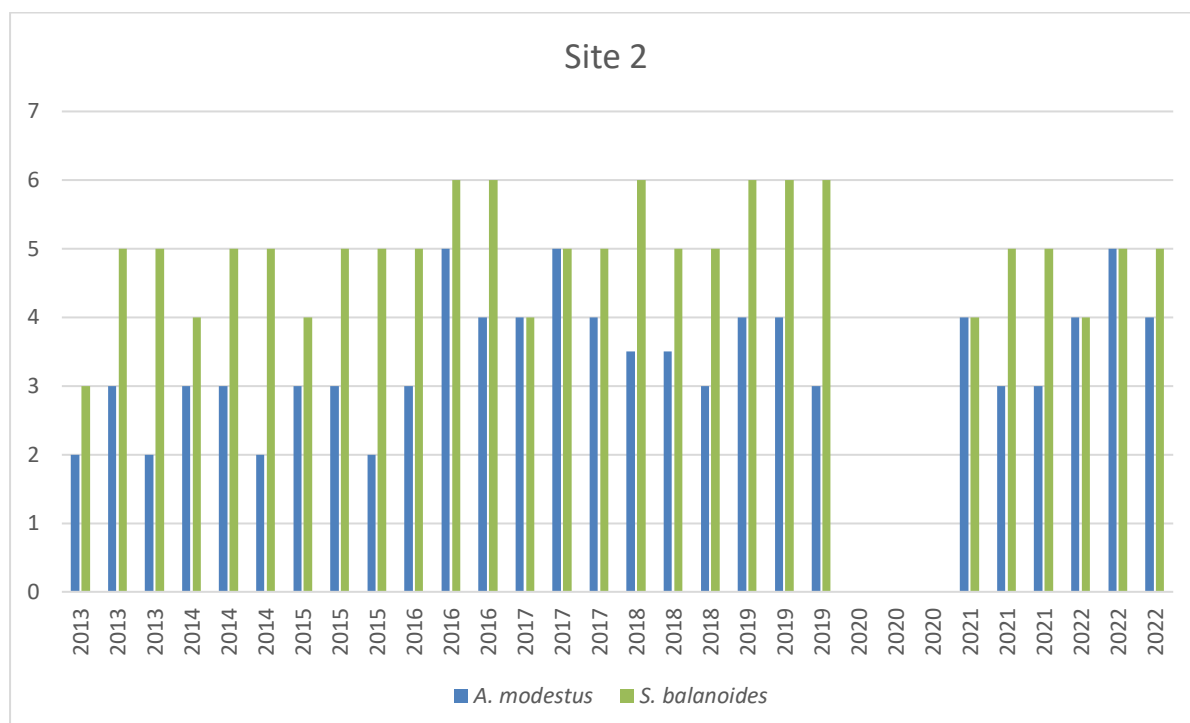
A total of 23 pacific oysters were observed on the harbour wall, although not within the sample quadrats.



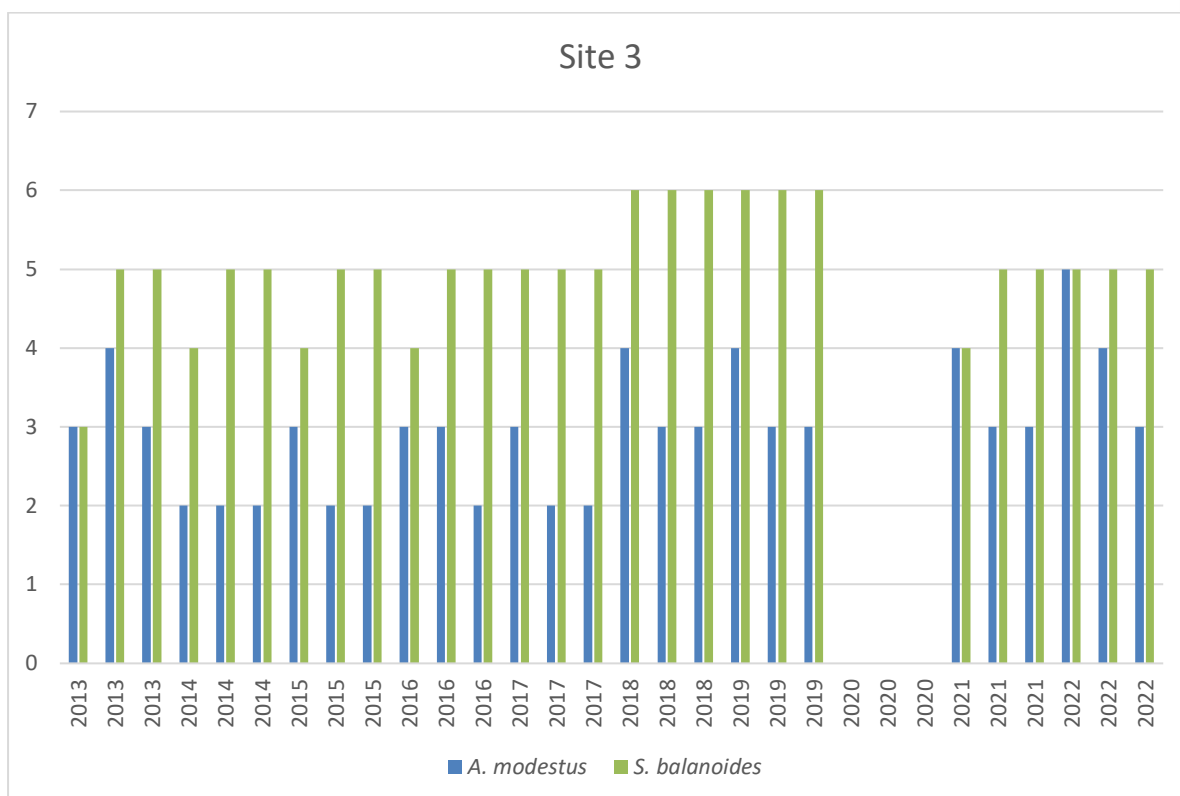
For graphical representation, a number was assigned to each of levels of the SACFOR scale (see Table 9, Appendix 2). Where an abundance was recorded between two levels of the scale (e.g. F/C) the number allocated was a decimal, halfway between the two values (e.g. 3.5).



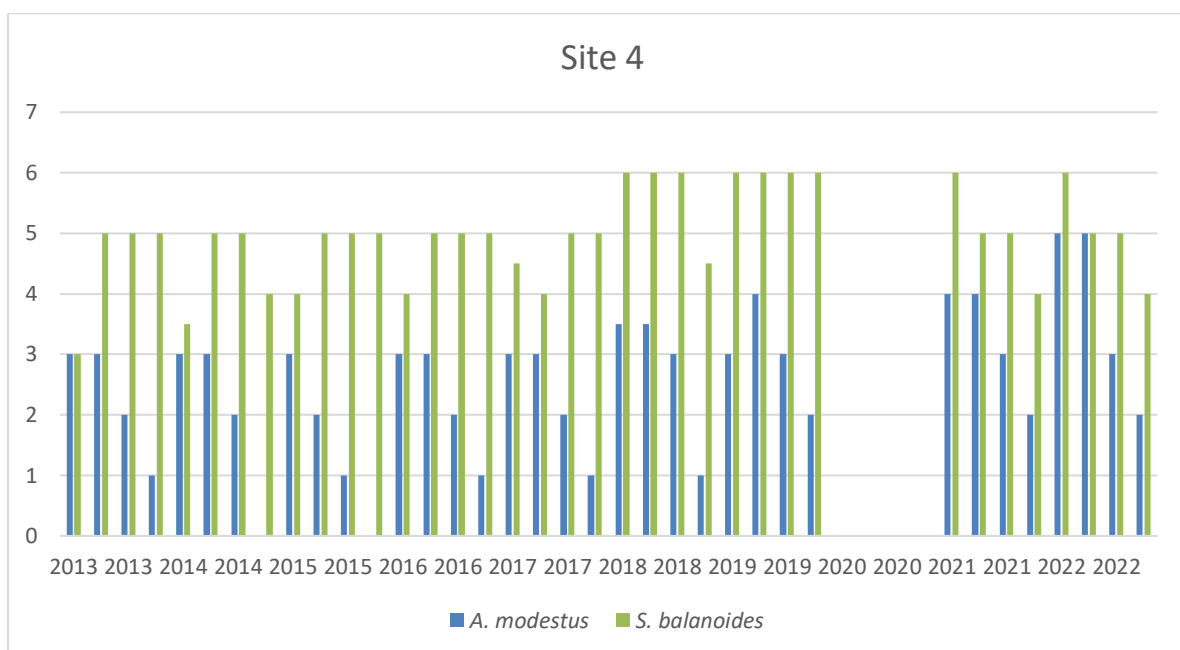
Graph 1. Abundance of *A. modestus* and *S. balanoides* at site 1.



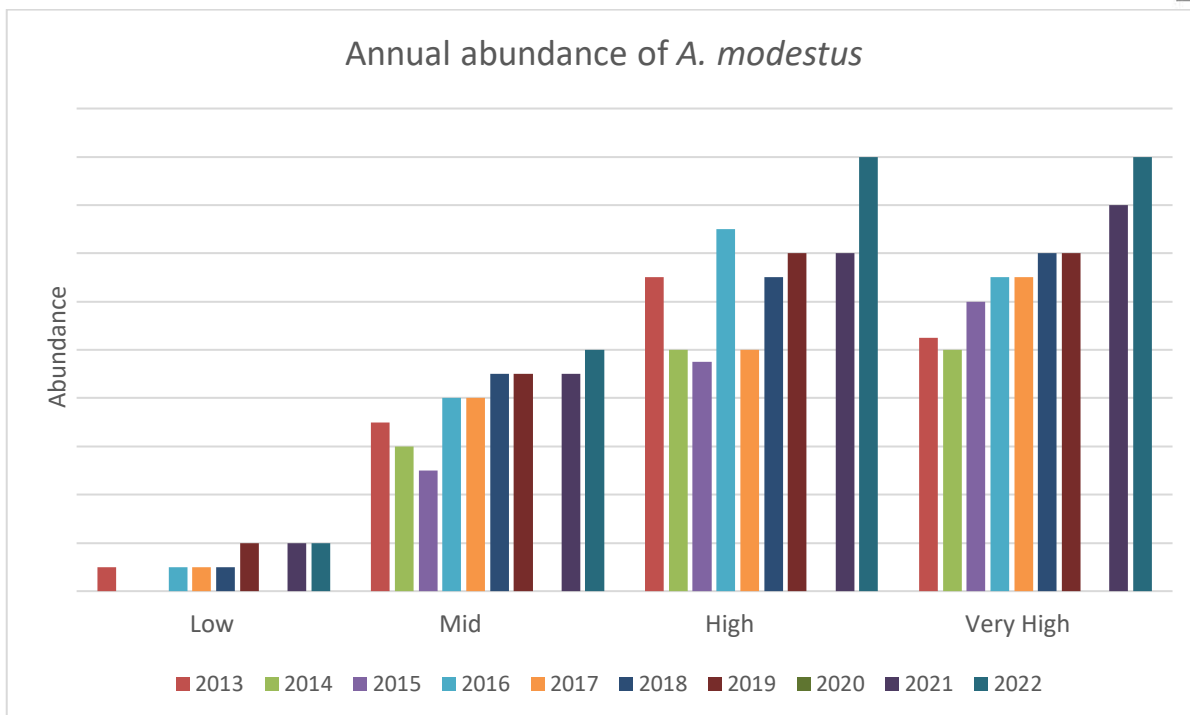
Graph 2. Abundance of *A. modestus* and *S. balanoides* at site 2.



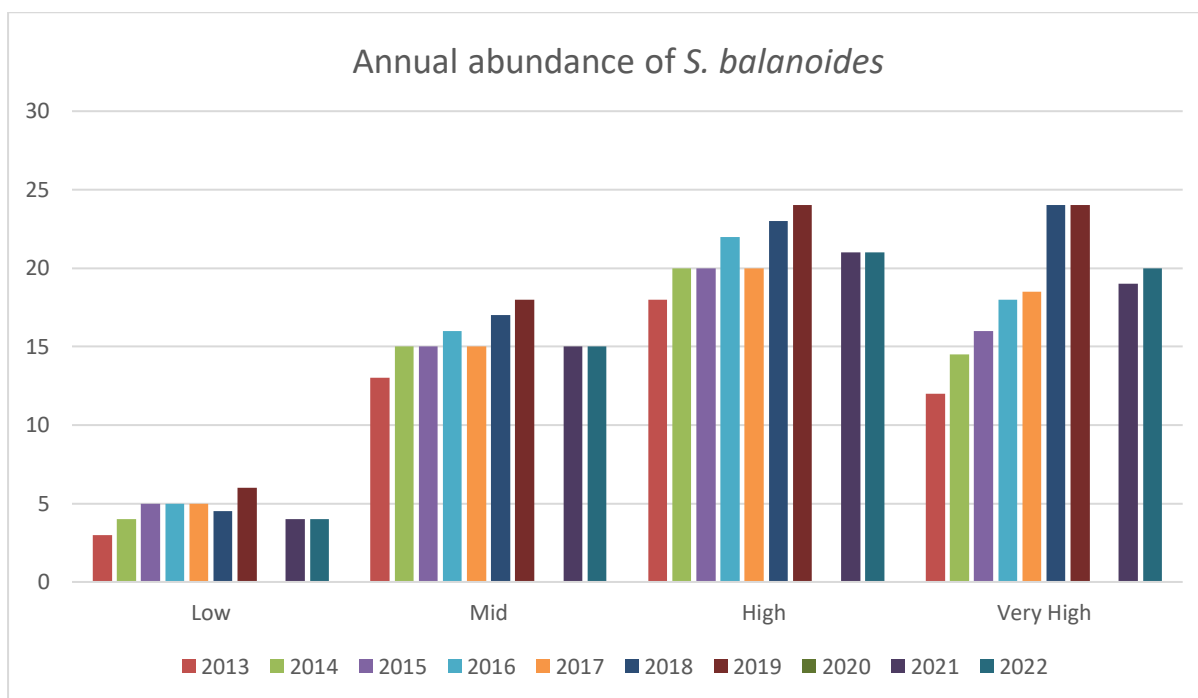
Graph 3. Abundance of *A. modestus* and *S. balanoides* at site 3.



Graph 4. Abundance of *A. modestus* and *S. balanoides* at site 4.



Graph 5. Abundance of *A. modestus* at each tidal height.



Graph 6. Abundance of *S. balanoides* at each tidal height.



## Discussion

The abundance of two species of barnacles was measured, the invasive Australian species of barnacle *Austrominius modestus* and the native *Semibalanus balanoides*. The non-native *A. modestus* has increased in abundance over the past years resulting in all sites now showing abundance as frequent, common, or abundant, with the exception of site 4 at low water which was recorded as occasional. This is not surprising as the species is associated with the upper shore. Since the last survey in 2021, no increase in abundance was recorded at the low tidal areas, however an increase in abundance from frequent/common to common was recorded at the very high, high and mid locations. At site 1, no increase in abundance was recorded at either tidal height. At site 2, an increase in abundance from frequent to common was recorded at the mid-tide level and from frequent to abundant at the high-tide level. At site 3, an increase in abundance from frequent to common was recorded at the high-tide level and from common to abundant at the very high-tide level. At site 4, both abundance recordings increased from common to abundant at the high and very high-tide levels.

Since the last survey in 2021, the abundance of *S. balanoides* has remained the same in all four tidal ranges, with the exception of the very high-tide location at site 3 which increased from common to abundant. The abundance of this native barnacle was recorded as abundant or superabundant at ten of the twelve sites in 2022, compared with nine of the twelve sites in 2021, and superabundant at all twelve sites in 2019.

There have been no significant variations in the population of *M. edulis* recorded since the survey began in 2013, we could therefore conclude that *M. edulis* has limited value as an indicator species when looking at the variances in barnacle and other species colonisation in this particular area. Absence of this species is more likely due to the unsuitable habitat/substrate the area provides, rather than direct competition from invasive or other species.

A total of 23 Pacific oysters (*C. gigas*) were observed during the survey, showing new recruitment to the site since the complete eradication of all visible specimens in 2018. All individuals were identified between sites 3 & 4 and beyond, but none within the surveyed quadrats. This shows that spat is drifting in from other areas, possible from NW England or the Galloway coast. These individuals should be removed annually to prevent further population growth and spread.

It should be noted that the SACFOR scale has its limitations, originally developed for standardised, semi-qualitative surveys for experienced biologist to undertake roving surveying techniques (Hiscock, [1998](#)), it can still lead to recorder bias which is subjective leading to observer variability and not considered sufficiently quantitative for close monitoring purposes. Nevertheless, the findings from this annual survey show that the presence of *A. modestus* is increasing. However, there appears to be no significant impact on our native *B. balanoides*.

## References

- Crisp, J. 1985. The spread of *Elminius modestus* Darwin in North-West Europe. Journal of the marine Biological Association of the United Kingdom. 37: 483-520.
- Crisp, J. & Southward, J. 1959. The further spread of *Elminius modestus* in the British Isles to 1959. Marine Biological Association of the U.K. 38: 429-437.



Kobayashi, M., Hofman, E.E., Powell, E.N., Klinck, J.M. and Kusaka, K. 1997. A population dynamics model for the Japanese oyster, *Crassostrea gigas*. *Aquaculture* 149: 285-321.





## Appendix 1 – Survey methods

Scales:	Small Barnacles	Mussels
S = Superabundant	3-5cm <sup>-2</sup>	50-79% cover
A = Abundant	> 1cm <sup>-2</sup>	>20% cover
C = Common	0.1-1cm <sup>-2</sup>	Large patches
F = Frequent	100-1000m <sup>-2</sup>	Scattered individuals/small patches
O = Occasional	1-100m <sup>-2</sup>	Scattered individuals, no patches
R = Rare	Few found	Few found
N = Not found	None found	None found

### Survey Methods

All 4 species that were expected were found and quantified. These were the non-native species *Austrominius modestus* (Australian barnacle) and *Crassostrea gigas* (Pacific oyster) and two morphologically similar species which were selected as appropriate indicator proxies for assessment of the two non-native species: *Mytilus edulis* (edible mussel) and *Semibalanus balanoides* (barnacle). Survey methodology was based on the SACFOR scale, which uses several native species as representative size/morphology types for measuring abundance (See above). The scales for *Small Barnacles* and *Mussels* were used for the barnacle and oyster/mussel species respectively.

For barnacle abundance only, each survey station was divided vertically by eye according to tidal height marks on the wall associated with barnacle abundance. These 4 zones were classified as 'very high shore/intertidal', 'high shore', 'mid shore' and 'low shore'. Due to the beach gradient and reach of the tide up the pier wall, not all stations had all zones present. At each present zone of each station, a horizontal area of a few metres was examined by several teams of 2-3 individual surveyors and the abundance score determined. Subsequently, all survey teams agreed on a final abundance score for the zone, taking account of each team assessment. A tally of all *C. gigas* was kept independently by 2 different recorders and compared at the end. Data was recorded onto pre-designed recording sheets.



## Appendix 2 – Previous results

### 2021 results

Species	Site 1		Site 2			Site 3			Site 4			
	VH	H	VH	H	M	VH	H	M	VH	H	M	L
<i>A. modestus</i>	C	C	C	F	F	C	F	F	C	C	F	O
<i>S. balanoides</i>	A	SA	C	A	A	C	A	A	S	A	A	C
<i>C. gigas</i>	BEEN REMOVED ENTIRELY IN 2018											
<i>M. edulis</i>	N	N	N	N	N	N	N	R	N	N	N	R

Table A1. Results of the invasive species survey 2021.

During 2020, no data was collected due to restrictions in place for the mitigation of the Covid 19 virus.

### 2019 results

Species	Site 1		Site 2			Site 3			Site 4			
	VH	H	VH	H	M	VH	H	M	VH	H	M	L
<i>A. modestus</i>	F	F	C	C	F	C	F	F	F	C	F	O
<i>S. balanoides</i>	S	S	S	S	S	S	S	S	S	S	S	S
<i>C. gigas</i>	BEEN REMOVED ENTIRELY IN 2018											
<i>M. edulis</i>	N	N	N	N	N	N	N	R	N	N	N	R

Table A2. Results of the invasive species survey 2019.

### 2018 results

Species	Site 1		Site 2			Site 3			Site 4			
	VH	H	VH	H	M	VH	H	M	VH	H	M	L
<i>A. modestus</i>	F	F	C/F	C/F	F	C	F	F	F/C	F/C	F	R
<i>S. balanoides</i>	S	S	S	A	A	S	S	S	S	S	S	C/A
<i>C. gigas</i>	BEEN REMOVED ENTIRELY											
<i>M. edulis</i>	O	O	N	N	N	N	N	R	N	N	N	R

Table A3. Results of the invasive species survey 2018.

### 2017 Results

Species	Site 1		Site 2			Site 3			Site 4			
	VH	H	VH	H	M	VH	H	M	VH	H	M	L
<i>A. modestus</i>	F	O	C	A	C	F	O	O	F	F	O	R
<i>S. balanoides</i>	A	S	C	A	A	A	A	A	C/A	C	A	A
<i>C. gigas</i>	N	N	N	N	N	N	N	$\frac{1}{2}$ Shell	N	N	N	R
<i>M. edulis</i>	N	N	N	N	N	N	N	N	N	N	R	N

Table A4. Results of invasive species survey 2017.



### 2016 Results

<i>Species</i>	Site 1		Site 2			Site 3			Site 4			
	VH	H	VH	H	M	VH	H	M	VH	H	M	L
<i>A. modestus</i>	C	C	F	A	C	F	F	O	F	F	O	R
<i>S. balanoides</i>	A	S	A	S	S	C	A	A	C	A	A	A
<i>C. gigas</i>	N	N	N	N	N	N	N	N	N	N	N	R
<i>M. edulis</i>	N	N	N	R	N	N	N	O	N	N	N	R

Table A5. Results of invasive species survey 2016.

### 2015 Results

<i>Species</i>	Site 1		Site 2			Site 3			Site 4			
	VH	H	VH	H	M	VH	H	M	VH	H	M	L
<i>A. modestus</i>	F	O/F	F	F	O	F	O	O	F	O	R	N
<i>S. balanoides</i>	C	A	C	A	A	C	A	A	C	A	A	A
<i>C. gigas</i>	N	N	N	N	N	N	N	O	N	N	N	R
<i>M. edulis</i>	N	N	N	R	R	N	R	R	R	N	N	R

Table A6. Results of invasive species survey 2015.

### 2014 Results

<i>Species</i>	Site 1		Site 2			Site 3			Site 4			
	VH	H	VH	H	M	VH	H	M	VH	H	M	L
<i>A. modestus</i>	O	O	F	F	O	O	O	O	F	F	O	N
<i>S. balanoides</i>	F	A	C	A	A	C	A	A	C/F	A	A	C
<i>C. gigas</i>	N	N	N	N	N	N	N	O	N	N	N	O
<i>M. edulis</i>	N	R	N	R	R	N	R	O	N	R	R	O

Table A7. Results of invasive species survey 2014.

### 2013 Results

<i>Species</i>	Site 1		Site 2			Site 3			Site 4			
	VH	H	VH	H	M	VH	H	M	VH	H	M	L
<i>A. modestus</i>	O/F	F	O	F	O	F	C	F	F	F	O	R
<i>S. balanoides</i>	F	A	F	A	A	F	A	A	F	A	A	A
<i>C. gigas</i>	N		N			O			F			
<i>M. edulis</i>	N		N			O			N			

Table A8. Results of invasive species survey 2013.



<b>Key:</b>			S =	Superabundant
VH =	Very high		A =	Abundant
H =	High		C =	Common
M =	Mid		F =	Frequent
L =	Low		O =	Occasional
			R =	Rare
			N =	Not present

Table A8. Key to tables 1-7 (see Appendix 1 for detailed SACFOR scale).

S =	Superabundant	6
A =	Abundant	5
C =	Common	4
F =	Frequent	3
O =	Occasional	2
R =	Rare	1
N =	Not present	0

Table A9. Numerical's assigned to SACFOR scale