

ASSESSING THE DEGREE OF MAERL HABITAT
FRAGMENTATION AFFECTING FISH SPECIES RICHNESS AND
ABUNDANCE

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INTRODUCTION

What Is Maerl?

- Calcified red algae, crust-like formation on beds of algal gravel, species based on level of calcification [6]
- Grows thousands of years at high densities from shoreline to 30m below sea level [6]

Why Is Maerl Important?

- Most juvenile gadoids depend on near shore areas (e.x. maerl habitat) during benthic settlement [8]
- Physical refuge & predation protection to support adult recruitment [8], [13]
- Juvenile commercial fish species seen in maerl habitats: Atlantic cod (*Gadus Morhua*), saithe (*Pollachius virens*), and pollack (*Pollachius pollachius*) [8]



Maerl In Iceland

- Documented in Arnarfjörður & Hvammsfjörður but little information on distribution & abundance [4]
- 170 mill cubic m found in Ísafjarðardjúp & Jökulfirðir from geological survey in 2013 [11], [12]

Habitat Fragmentation

- Habitat loss & change in structure, cause edge effects to fish communities [7]
- Edges along exterior of habitat patch & increases with fragmented area [7]
 - Increase competition & predation

MAIN AIMS & RESEARCH QUESTION

- Main Aim: To assess fish inhabiting maerl beds in Iceland.
- Specifically, do juvenile gadoids use maerl as nursery grounds during benthic settlement and does maerl percent coverage and fragmentation affect abundance?

MATERIALS & METHODS

Study Site

- Fjord called Ísafjörður in Ísafjardardjúp, Iceland (Figure 1)

SCUBA Dive Survey & Side-Scan Sonar Protocol

- 2 maerl patches & 1 gravel site
 - 2 transect lines at the centres, 2 at the edges, & 1 gravel site line (50m length with 10m intervals)
 - Depths of 5m-20m, perpendicular from shore
- Total SCUBA dives = 30 with 2 divers from July to September of 2019
- Depth, habitat classification, and confirmation of maerl percent cover estimates determined from side-scan sonar system & using SCUBA observations as ground-truthing

Fish Abundance, Richness, & Maerl Percent Coverage

- Juvenile gadoid fish recorded
- Maerl recorded as vegetation, estimated % coverage recorded/10m interval, & not specified by species [9]
- Other estimated substrate % type: Coarse Sand, Cobble, Silt, Gravel, & Mud [2], [14]

RESULTS

TABLE 1(a) Overview of transect lines and data collection						
Site		Number of dives	Depth (m)	Maerl % cover	Fish total	Diving dates
East	Maerl center	6	7-14	50-100	81	15.7.2019-26.9.2019
	Maerl edge	6	7-11	25-75	6	15.7.2019-26.9.2019
West	Maerl center	6	13-17	75-100	49	9.7.2019-26.9.2019
	Maerl edge	6	8-14	50-100	5	15.7.2019-26.9.2019
	Gravel	10	10-19	0-25	22	9.7.2019-25.9.2019

TABLE 1(b) Results from GLMM on number of juveniles observed					
		Estimate	Std. error	z-value	p-value
Intercept		-7.867	0.825	-9.532	<0.001
East	Maerl center	5.423	0.447	12.134	<0.001
	Maerl edge	4.517	0.717	6.303	<0.001
West	Maerl center	4.284	0.596	7.189	<0.001
	Maerl edge	3.875	0.719	5.396	<0.001
Depth		0.448	0.043	10.322	<0.001
Maerl % cover		-0.05	0.007	-6.936	<0.001

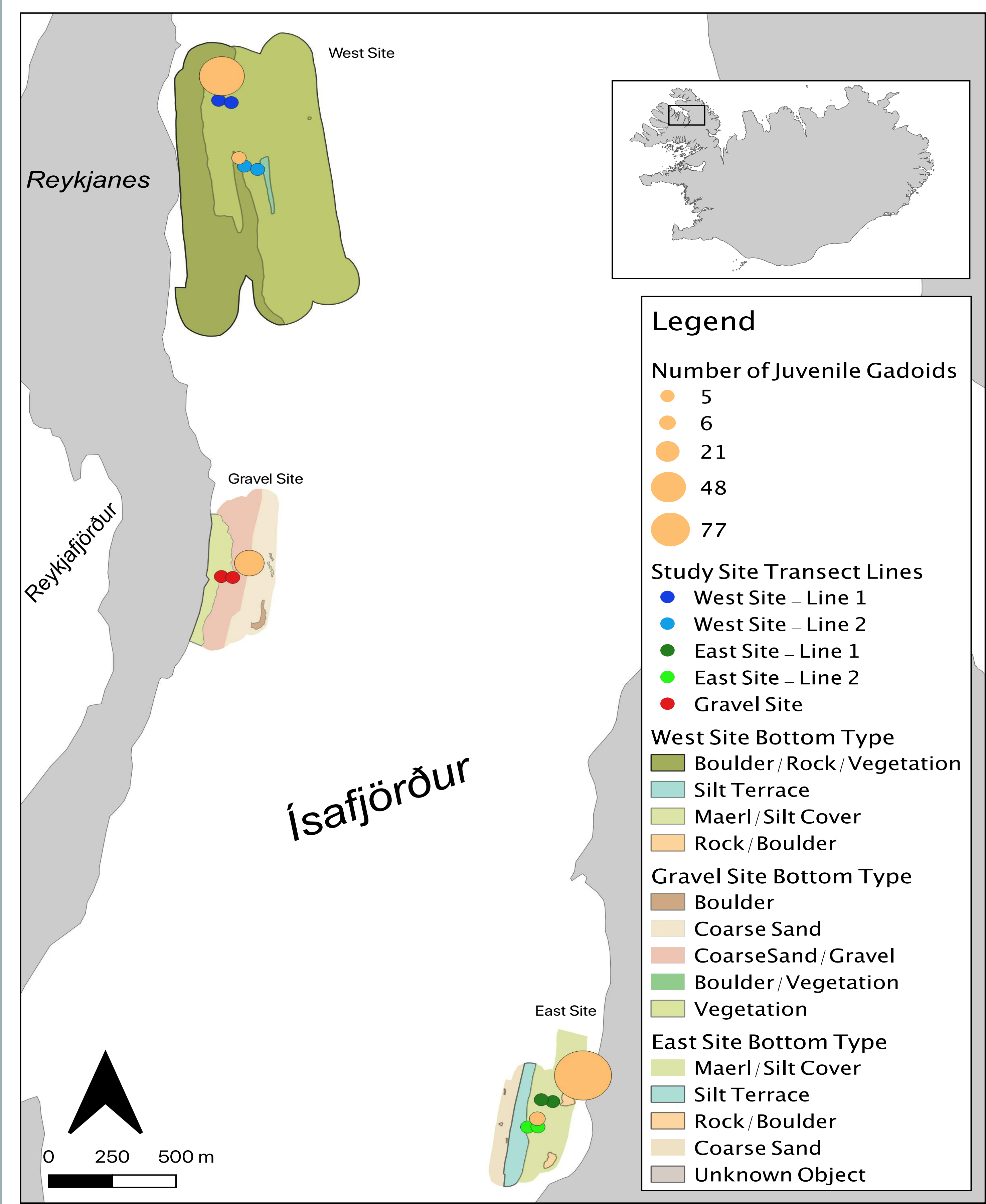


Figure 1. The amount of juvenile gadoid fish observed with bottom classification of the maerl patches and gravel site.

DISCUSSION

- **Juvenile gadoids were found most frequent on maerl beds than the gravel site**
 - More fish seen on maerl edges than gravel site (Table 1b)
 - Number of fish seen on maerl edges was less than maerl centers (Table 1a)
 - Higher maerl cover did not correlate with more fish (Table 1b)
 - Overall, results suggest edge effects
- 163 total fish counted
 - **juvenile Atlantic cod (109 counted) and saithe (28 counted)**
 - other species included: European flounder (*Platichthys flesus*) and rock gunnel (*Pholis gunnellus*)
- **Maerl is protected in areas along the Atlantic and Mediterranean Sea [1], [10]**
 - EU Habitats Directive (92/43/EEC) classified *Lithothamnion corallioides* and *Phymatolithon calcareum* as threatened in the North-East Atlantic [11], [5]
- **Little known of maerl distribution and associated biodiversity in North-Atlantic** (ex. Current knowledge in Iceland mostly based from extraction sites) [1], [3]
- Study adds information on maerl as fish nursery grounds and biota associated with maerl in Iceland

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