

MARINE TAXONOMIC SERVICES, LTD

Port Orford Dredged Material Disposal Site

Demersal Fish Sampling

Prepared for ANAMAR Environmental Consulting, Inc.

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INTRODUCTION

The United States Army Corps of Engineers (USACE) maintains a nearshore dredge material disposal site for clean dredge sand disposal near the offshore of Port Orford Harbor in Port Orford, Oregon. The site is designated as the Port Orford Nearshore Disposal Site (hereafter referred to as Nearshore Disposal Site) and is intended as a receiver site for dredged material removed from the harbor in Port Orford (Figure 1).

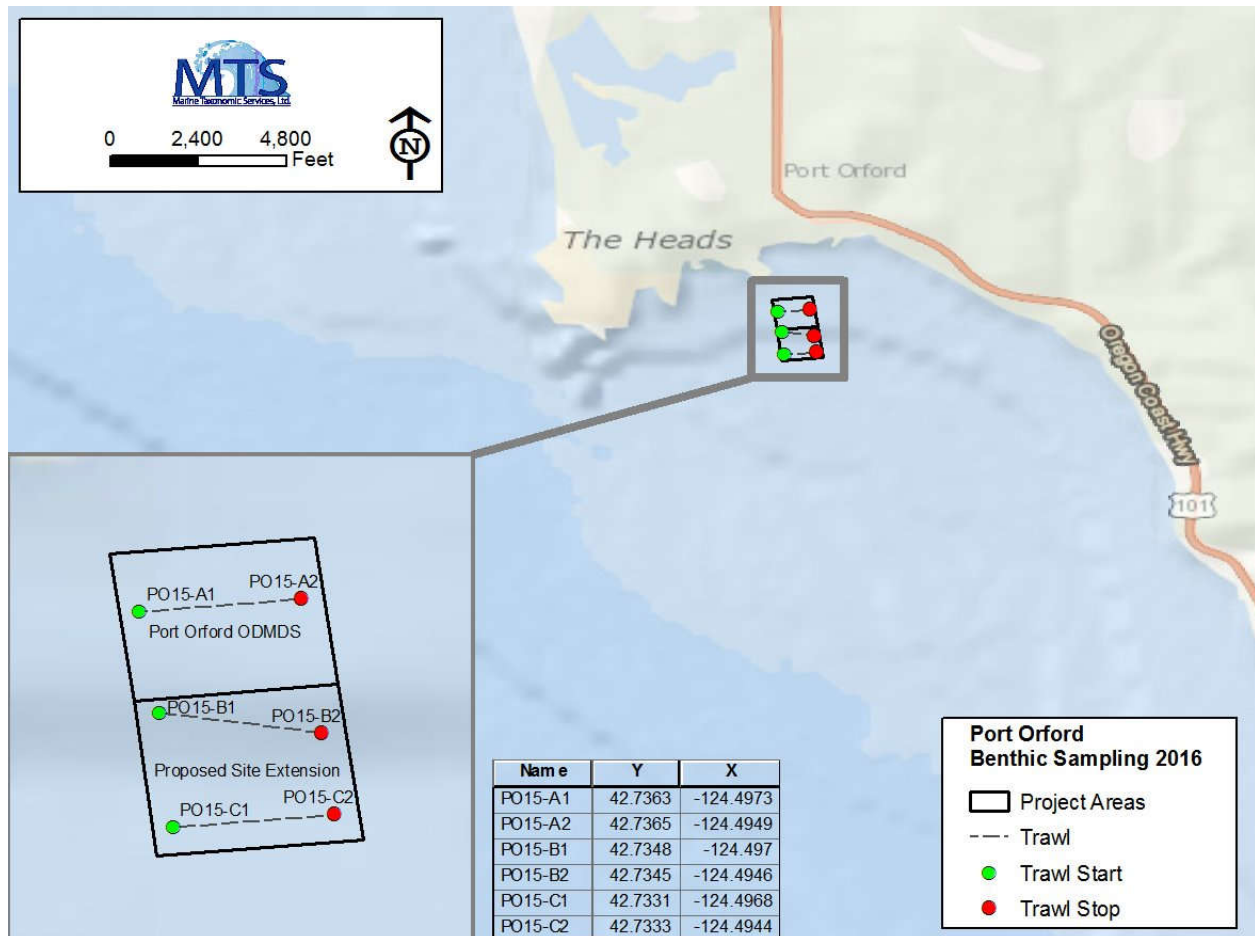


Figure 1. The above figure shows the position of the Port Orford Nearshore Disposal Site relative to Port Orford, Oregon and shows the proposed location of epibenthic trawl samples relative to the Nearshore Disposal Site and the proposed Expansion Area.

The purpose of this report is to present the methods and results associated with the 2016 demersal fish and epibenthic monitoring of the Port Orford Nearshore Disposal Site. Demersal fish and invertebrates are important to regional sport and commercial fisheries and can be used as indicators of benthic ecosystem health. Diverse demersal fish and invertebrate communities are generally indicative of a healthy seafloor environment that provides for a diversity of prey items and habitats. Communities dominated by few species may indicate significant disturbance due to physical, environmental, or biological stress or a relatively homogenous habitat. The primary epibenthic species of concern in the region is the Dungeness crab (*Metacarcinus magister* [formerly *Cancer magister*]). Dungeness crab is a wide-ranging species that is important to commercial and sport fisheries.

METHODS AND MATERIALS

Marine Taxonomic Services, Ltd. (MTS) staff Seth Jones and Dr. Robert Mooney worked with Michelle Rau of ANAMAR Environmental Consulting to perform trawls for demersal fish and epibenthic invertebrates while adhering to methods outlined by the USACE in the quality assurance project plan. The team worked aboard the MTS Research Vessel and was assisted by USACE representatives. Trawl samples were collected at the Port Orford Nearshore Disposal Site on August 20, 2016.

The demersal fish and epibenthic study used a 12-foot semi-balloon otter trawl with 32-mm stretch mesh at the front of the net and 10-mm stretch mesh at the bag end to collect trawls at each of three predetermined trawl start points. The trawls were towed at approximately 1.9 to 2.1 knots for 3 minutes. The short duration relative to the "10-minute" trawls specified in the quality assurance project plan was due to the size of this disposal site. The team attempted to start the transects as close as possible to the provided trawl points by estimating how long it would take to deploy the net to the seafloor. The trawl logs and tracks were monitored by ANAMAR and are provided as Appendix C. Trawls were towed in depths ranging from approximately -36 feet to -59 feet MLLW. The trawls were towed parallel with the bottom contours and in accordance with the proposed end points within the quality assurance project plan. The trawl end points and direction of travel are provided in Table 1.

Table 1. The below table provides the otter trawl location and summary data for trawls performed at the Port Orford Nearshore Disposal Site in August 2016. Coordinates are geographic, NAD1983, decimal degrees.

Station	Trawl Start		Trawl End		Heading	Distance (m)
	Latitude	Longitude	Latitude	Longitude		
P015-A	42.7363	-124.4973	42.7365	-124.4949	E	182
P015-B	42.7348	-124.4948	42.7345	-124.4970	E	185
P015-C	42.7331	-124.4968	42.7333	-124.4944	E	185

The trawls were lowered to the seafloor and retrieved using the staff and the vessel's aft-mounted davit and capstan winch. Upon retrieval of the trawl, the trawl contents were removed from the bag end of the trawl and placed into 40-liter, open-top containers. Fresh seawater was added to the containers to maintain dissolved oxygen levels for the captured animals. The fish and invertebrates were sorted, identified, measured and returned to the sea whenever possible. The remaining animals were placed into an appropriate sized container and preserved in a solution to 10% buffered formalin and seawater solution. These samples were transferred to 70% isopropyl alcohol after a minimum of 72 hours.

The fish and invertebrates were separated from other retained material. The fish were identified to the lowest practical taxa and measured to standard length. The invertebrates were noted for species and quantity. Dungeness crab were identified, sexed and measured (carapace width). Pelagic species were captured while the net was being deployed and recovered. Pelagic animals

were noted but are not appropriately sampled with the otter trawl; their capture is incidental and should not be considered part of the primary data record.

RESULTS

There were 155 fish captured within the three trawls towed at the Port Orford NDMS (Table 2). Of those captured, 5 were identified as smelt (*Osmeridae*). Smelt are pelagic species. Pelagic species are not readily captured by the otter trawl and likely represent fish captured in the water column as the net was deployed and recovered.

The captured fish were represented by 14 species (taxa). Removal of smelt taxa (pelagic) would mean that 13 demersal taxa were identified. The demersal species were dominated by sand sole (*Psettichthys melanostictus*), with 34 Sand sole captured. Sanddab (*Citharichthys sordidus*) and dover sole (*Solea solea*) were the next most abundant fish captured with 33 sanddab and 25 dover sole captured.

Most of the captured fish were represented by juvenile fish or fish that were sub-legal with regards to fishing regulations. The largest captured individual was a 28.9-cm staghorn sculpin (*Leptocottus armatus*). The raw fish trawl data are provided as Appendix A. No fish were captured with notable parasites attached or lesions.

There were 7,961 invertebrates captured in the otter trawls (Table 4). There were 15 taxa of benthic invertebrates captured. Each of the taxa that were not identified to species likely represent single species. The only notable exceptions may be the crangon and mysid shrimp. Although it is likely that the two shrimp taxa are all the same (within their taxa), there may be multiple species represented among the small individuals found.

The captured Dungeness crabs were primarily represented by adults ranging between 4.6 and 11.8 cm; there were 50 of these adults caught. There were 18 young of year Dungeness crab captured in the trawls ranging between 0.9 and 1.7 cm. The raw invertebrate data are included as Appendix B.

Table 2. August 2016 demersal fish trawl data for the Port Orford Nearshore Disposal Site.

		Demersal Fish							
Fish Species		PO-A		PO-B			Station PO-C		
Brown Irish Lord <i>Hemilepidotus spinosus</i>	Number	0		1			0		
	Density (no./hectare)	0		15			0		
	Min- Max Length (mm)	-		2	-	27	-		
	Average Length (mm)			27.0					
Butter Sole <i>Isopsetta isolepis</i>	Number	3		2			1		
	Density (no./hectare)	45		10			15		
	Min- Max Length (mm)	3	- 36	2	-	29	21	-	40
	Average Length (mm)	34.0		29.0			21.0		
Dover Sole <i>Solea solea</i>	Number	0		2			25		
	Density (no./hectare)	0		10			369		
	Min- Max Length (mm)	-		2	-	29	23	-	40
	Average Length (mm)			29.0			48.0		
English Sole <i>Parophrys vetulus</i>	Number	10		1			3		
	Density (no./hectare)	150		15			44		
	Min- Max Length (cm)	26	- 45	25	-	25	24	-	78
	Average Length (cm)	36		25.0			29.7		
Juvenile Rockfish <i>Sebastes Sp</i>	Number	0		1			1		
	Density (no./hectare)	0		15			15		
	Min- Max Length (mm)	-		3	-	38	30	-	48
	Average Length (mm)			30.0			38.5		
N. Spearnose Poacher <i>Agonopsis vulsa</i>	Number	2		5			4		
	Density (no./hectare)	30		74			59		
	Min- Max Length (mm)	1	- 39	19	-	37	26	-	65
	Average Length (mm)	34.5		24.8			35.8		
Pacific Tomcod <i>Microgadus proximus</i>	Number	0		0			6		
	Density (no./hectare)	0		0			89		
	Min- Max Length (mm)	-		-			51	-	65
	Average Length (mm)						60.2		
Picklebreast Poacher <i>Stellerina xyosterna</i>	Number	0		1			14		
	Density (no./hectare)	0		15			207		
	Min- Max Length (mm)	-		71	-	71	32	-	135
	Average Length (mm)			71.0			37.9		
Sand Dab <i>Lepidopsetta bilineata</i>	Number	8		9			16		
	Density (no./hectare)	120		133			236		
	Min- Max Length (mm)	38	- 72	36	-	98	47	-	78
	Average Length (mm)	60		66.2			70.9		
Sand Lance <i>Ammodytidae Sp</i>	Number	0		0			1		
	Density (no./hectare)	0		0			15		
	Min- Max Length (mm)	-		-			75	-	343
	Average Length (mm)						75.0		
Sand Sole <i>Psettichthys melanostictus</i>	Number	29		34			4		
	Density (no./hectare)	436		502			59		
	Min- Max Length (mm)	3	- 126	3	-	34	35	-	343
	Average Length (mm)	57.0		34.0			67.3		
Showy Snail Fish <i>Liparis pulchellus</i>	Number	0		1			2		
	Density (no./hectare)	0		15			30		
	Min- Max Length (mm)			1		13	38		30
	Average Length (mm)			13.0			48.0		
Staghorn Sculpin <i>Leptocottus armatus</i>	Number	0		1			0		
	Density (no./hectare)	0		15			0		
	Min- Max Length (mm)	-		289	-	289	-		
	Average Length (mm)			289					
Pelagic Fish									
Smelt <i>Osmeridae</i>	Number	0		4			1		
	Density (no./hectare)	0		59			15		
	Min- Max Length (mm)	-		19	-	116	117	-	72
	Average Length (mm)			52.0			117		

Table 3. August 2016 invertebrate trawl data for the Port Orford Nearshore Disposal Site.

Benthic Invertebrates		Station		
Invertebrate Species		PO-A	PO-B	PO-C
Amphipod	Number	1	1	2
<i>Atylus tridens</i>	Density(no./hectare)	15	15	30
Amphipod	Number	0	1	0
<i>Microjassa sp.</i>	Density(no./hectare)	0	15	0
Bigeye Amphipod	Number	1	0	0
<i>Hyperia medusarum</i>	Density(no./hectare)	15	0	0
Cancer Crab	Number	1	3	0
<i>Cancer sp.</i>	Density(no./hectare)	15	44	0
Crangon Shrimp	Number	3176	984	2434
<i>Crangonidae</i>	Density (no./hectare)	47695	1447	35958
Hermit Crab	Number	0	1	4
<i>Pagurus sp.</i>	Density(no./hectare)	0	15	159
Isopod	Number	1	2	0
<i>Tecticeps convexus</i>	Density(no./hectare)	15	30	0
Dungeness Crab (Female)	Number	7	3	14
<i>Metacarcinus magister</i>	Density (no./hectare)	103	44	207
Dungeness Crab (Juvenile)	Number	1	10	7
<i>Metacarcinus magister</i>	Density(no./hectare)	15	148	103
Dungeness Crab (Male)	Number	7	3	16
<i>Metacarcinus magister</i>	Density (no./hectare)	103	44	236
Mysid Shrimp	Number	312	607	353
<i>Neomysis rayi</i>	Density(no./hectare)	4685	8967	5215
Olive Snail	Number	2	0	0
<i>Olivella pycna</i>	Density(no./hectare)	30	0	0
Red Rock Crab	Number	1	0	0
<i>Cancer Productus</i>	Density(no./hectare)	15	0	0
Whelk	Number	1	0	0
<i>Colus Bolus</i>	Density(no./hectare)	15	0	0

APPENDIX A


Fish Trawl Data

Date	Station	Name	Scientific Name	Length (mm)	N
08/20/16	PO-A	Northern Spearnose Poacher	<i>Agonopsis vulsa</i>	39	1
08/20/16	PO-A	Northern Spearnose Poacher	<i>Agonopsis vulsa</i>	15	1
08/20/16	PO-A	English Sole	<i>Parophrys vetulus</i>	35	1
08/20/16	PO-A	English Sole	<i>Parophrys vetulus</i>	41	1
08/20/16	PO-A	English Sole	<i>Parophrys vetulus</i>	45	1
08/20/16	PO-A	English Sole	<i>Parophrys vetulus</i>	40	1
08/20/16	PO-A	English Sole	<i>Parophrys vetulus</i>	36	1
08/20/16	PO-A	English Sole	<i>Parophrys vetulus</i>	26	1
08/20/16	PO-A	English Sole	<i>Parophrys vetulus</i>	32	1
08/20/16	PO-A	English Sole	<i>Parophrys vetulus</i>	27	1
08/20/16	PO-A	English Sole	<i>Parophrys vetulus</i>	32	1
08/20/16	PO-A	English Sole	<i>Parophrys vetulus</i>	46	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	40	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	36	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	41	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	32	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	51	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	34	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	49	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	38	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	37	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	126	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	114	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	121	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	73	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	84	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	71	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	63	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	51	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	56	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	47	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	41	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	46	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	62	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	50	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	54	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	40	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	58	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	42	1

08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	53	1
08/20/16	PO-A	Sand Sole	<i>Psettichthys melanostictus</i>	44	1
08/20/16	PO-A	Butter Sole	<i>Isopsetta isolepis</i>	31	1
08/20/16	PO-A	Butter Sole	<i>Isopsetta isolepis</i>	35	1
08/20/16	PO-A	Butter Sole	<i>Isopsetta isolepis</i>	36	1
08/20/16	PO-A	Sand Dab	<i>Citharichthys sordidus</i>	72	1
08/20/16	PO-A	Sand Dab	<i>Citharichthys sordidus</i>	68	1
08/20/16	PO-A	Sand Dab	<i>Citharichthys sordidus</i>	60	1
08/20/16	PO-A	Sand Dab	<i>Citharichthys sordidus</i>	58	1
08/20/16	PO-A	Sand Dab	<i>Citharichthys sordidus</i>	57	1
08/20/16	PO-A	Sand Dab	<i>Citharichthys sordidus</i>	64	1
08/20/16	PO-A	Sand Dab	<i>Citharichthys sordidus</i>	63	1
08/20/16	PO-A	Sand Dab	<i>Citharichthys sordidus</i>	38	1
TOTAL FISH COUNT FOR PO-A					52
08/20/16	PO-B	Staghorn Sculpin	<i>Leptocottus armatus</i>	289	1
08/20/16	PO-B	Sand Dab	<i>Citharichthys sordidus</i>	98	1
08/20/16	PO-B	Sand Dab	<i>Citharichthys sordidus</i>	82	1
08/20/16	PO-B	Sand Dab	<i>Citharichthys sordidus</i>	79	1
08/20/16	PO-B	Sand Dab	<i>Citharichthys sordidus</i>	71	1
08/20/16	PO-B	Sand Dab	<i>Citharichthys sordidus</i>	54	1
08/20/16	PO-B	Sand Dab	<i>Citharichthys sordidus</i>	72	1
08/20/16	PO-B	Sand Dab	<i>Citharichthys sordidus</i>	36	1
08/20/16	PO-B	Sand Dab	<i>Citharichthys sordidus</i>	58	1
08/20/16	PO-B	Sand Dab	<i>Citharichthys sordidus</i>	46	1
08/20/16	PO-B	Pricklebreast poacher	<i>Stellerina xyosterna</i>	71	1
08/20/16	PO-B	Sand Sole	<i>Psettichthys melanostictus</i>	34	1
08/20/16	PO-B	English Sole	<i>Parophrys vetulus</i>	25	1
08/20/16	PO-B	Northern Spearnose Poacher	<i>Agonopsis vulsa</i>	21	1
08/20/16	PO-B	Northern Spearnose Poacher	<i>Agonopsis vulsa</i>	37	1
08/20/16	PO-B	Northern Spearnose Poacher	<i>Agonopsis vulsa</i>	21	1
08/20/16	PO-B	Northern Spearnose Poacher	<i>Agonopsis vulsa</i>	26	1
08/20/16	PO-B	Northern Spearnose Poacher	<i>Agonopsis vulsa</i>	19	1
08/20/16	PO-B	Juvenile Rockfish	<i>Sebastes Sp</i>	38	1
08/20/16	PO-B	Brown Irish Lord	<i>Hemilepidotus spinosus</i>	27	1
08/20/16	PO-B	Smelt	<i>Osmeridae</i>	53	1
08/20/16	PO-B	Smelt	<i>Osmeridae</i>	116	1
08/20/16	PO-B	Smelt	<i>Osmeridae</i>	20	1
08/20/16	PO-B	Smelt	<i>Osmeridae</i>	19	1
08/20/16	PO-B	Showey Snailfish	<i>Laparis pulchellus</i>	13	1
TOTAL FISH COUNT FOR PO-B					25
08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	90	1



08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	127	1
08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	62	1
08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	67	1
08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	47	1
08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	112	1
08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	66	1
08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	66	1
08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	71	1
08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	61	1
08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	72	1
08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	65	1
08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	62	1
08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	47	1
08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	55	1
08/20/16	PO-C	Sand Dab	<i>Citharichthys sordidus</i>	65	1
08/20/16	PO-C	Sand Sole	<i>Psettichthys melanostictus</i>	140	1
08/20/16	PO-C	Sand Sole	<i>Psettichthys melanostictus</i>	35	1
08/20/16	PO-C	Sand Sole	<i>Psettichthys melanostictus</i>	48	1
08/20/16	PO-C	Sand Sole	<i>Psettichthys melanostictus</i>	46	1
08/20/16	PO-C	Pacific Tomcod	<i>Microgadus proximus</i>	70	1
08/20/16	PO-C	Pacific Tomcod	<i>Microgadus proximus</i>	60	1
08/20/16	PO-C	Pacific Tomcod	<i>Microgadus proximus</i>	59	1
08/20/16	PO-C	Pacific Tomcod	<i>Microgadus proximus</i>	52	1
08/20/16	PO-C	Pacific Tomcod	<i>Microgadus proximus</i>	51	1
08/20/16	PO-C	Pacific Tomcod	<i>Microgadus proximus</i>	69	1
08/20/16	PO-C	Showey Snailfish	<i>Laparis pulchellus</i>	58	1
08/20/16	PO-C	Showey Snailfish	<i>Laparis pulchellus</i>	38	1
08/20/16	PO-C	Pricklebreast poacher	<i>Stellerina xyosterna</i>	39	1
08/20/16	PO-C	Pricklebreast poacher	<i>Stellerina xyosterna</i>	45	1
08/20/16	PO-C	Pricklebreast poacher	<i>Stellerina xyosterna</i>	40	1
08/20/16	PO-C	Pricklebreast poacher	<i>Stellerina xyosterna</i>	45	1
08/20/16	PO-C	Pricklebreast poacher	<i>Stellerina xyosterna</i>	33	1
08/20/16	PO-C	Pricklebreast poacher	<i>Stellerina xyosterna</i>	47	1
08/20/16	PO-C	Pricklebreast poacher	<i>Stellerina xyosterna</i>	35	1
08/20/16	PO-C	Pricklebreast poacher	<i>Stellerina xyosterna</i>	32	1
08/20/16	PO-C	Pricklebreast poacher	<i>Stellerina xyosterna</i>	39	1
08/20/16	PO-C	Pricklebreast poacher	<i>Stellerina xyosterna</i>	35	1
08/20/16	PO-C	Pricklebreast poacher	<i>Stellerina xyosterna</i>	32	1
08/20/16	PO-C	Pricklebreast poacher	<i>Stellerina xyosterna</i>	39	1
08/20/16	PO-C	Pricklebreast poacher	<i>Stellerina xyosterna</i>	36	1
08/20/16	PO-C	Pricklebreast poacher	<i>Stellerina xyosterna</i>	34	1

08/20/16	PO-C	Sand Lance		Ammodytidae Sp	75	1
08/20/16	PO-C	Butter Sole		Isopsetta isolepis	21	1
08/20/16	PO-C	Juvenile Rockfish		Sebastes Sp	30	1
08/20/16	PO-C	Smelt		Osmeridae	117	1
08/20/16	PO-C	Northern Spearnose Poacher		Agonopsis vulsa	26	1
08/20/16	PO-C	Northern Spearnose Poacher		Agonopsis vulsa	42	1
08/20/16	PO-C	Northern Spearnose Poacher		Agonopsis vulsa	35	1
08/20/16	PO-C	Northern Spearnose Poacher		Agonopsis vulsa	40	1
08/20/16	PO-C	English Sole		Pleuronectes vetulus	35	1
08/20/16	PO-C	English Sole		Pleuronectes vetulus	30	1
08/20/16	PO-C	English Sole		Pleuronectes vetulus	24	1
08/20/16	PO-C	Dover Sole		Solea Solea	61	1
08/20/16	PO-C	Dover Sole		Solea Solea	50	1
08/20/16	PO-C	Dover Sole		Solea Solea	61	1
08/20/16	PO-C	Dover Sole		Solea Solea	65	1
08/20/16	PO-C	Dover Sole		Solea Solea	46	1
08/20/16	PO-C	Dover Sole		Solea Solea	72	1
08/20/16	PO-C	Dover Sole		Solea Solea	61	1
08/20/16	PO-C	Dover Sole		Solea Solea	35	1
08/20/16	PO-C	Dover Sole		Solea Solea	64	1
08/20/16	PO-C	Dover Sole		Solea Solea	46	1
08/20/16	PO-C	Dover Sole		Solea Solea	68	1
08/20/16	PO-C	Dover Sole		Solea Solea	56	1
08/20/16	PO-C	Dover Sole		Solea Solea	43	1
08/20/16	PO-C	Dover Sole		Solea Solea	45	1
08/20/16	PO-C	Dover Sole		Solea Solea	58	1
08/20/16	PO-C	Dover Sole		Solea Solea	45	1
08/20/16	PO-C	Dover Sole		Solea Solea	40	1
08/20/16	PO-C	Dover Sole		Solea Solea	52	1
08/20/16	PO-C	Dover Sole		Solea Solea	35	1
08/20/16	PO-C	Dover Sole		Solea Solea	44	1
08/20/16	PO-C	Dover Sole		Solea Solea	35	1
08/20/16	PO-C	Dover Sole		Solea Solea	41	1
08/20/16	PO-C	Dover Sole		Solea Solea	27	1
08/20/16	PO-C	Dover Sole		Solea Solea	26	1
08/20/16	PO-C	Dover Sole		Solea Solea	23	1
TOTAL FISH COUNT FOR PO-C						78

APPENDIX B

Invertebrate Trawl Data

Station	Name	Scientific Name	Length (mm)	N
PO-A	Male Dungeness Crab	<i>Metacarcinus magister</i>	92	1
PO-A	Male Dungeness Crab	<i>Metacarcinus magister</i>	73	1
PO-A	Male Dungeness Crab	<i>Metacarcinus magister</i>	78	1
PO-A	Male Dungeness Crab	<i>Metacarcinus magister</i>	74	1
PO-A	Male Dungeness Crab	<i>Metacarcinus magister</i>	82	1
PO-A	Male Dungeness Crab	<i>Metacarcinus magister</i>	91	1
PO-A	Male Dungeness Crab	<i>Metacarcinus magister</i>	64	1
PO-A	Female Dungeness Crab	<i>Metacarcinus magister</i>	96	1
PO-A	Female Dungeness Crab	<i>Metacarcinus magister</i>	76	1
PO-A	Female Dungeness Crab	<i>Metacarcinus magister</i>	89	1
PO-A	Female Dungeness Crab	<i>Metacarcinus magister</i>	82	1
PO-A	Female Dungeness Crab	<i>Metacarcinus magister</i>	80	1
PO-A	Female Dungeness Crab	<i>Metacarcinus magister</i>	81	1
PO-A	Female Dungeness Crab	<i>Metacarcinus magister</i>	86	1
PO-A	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	9	1
PO-A	Shrimp	<i>Mysida Spp.</i>		312
PO-A	Shrimp	<i>Crangon Spp.</i>		3176
PO-A	Olive Snail	<i>Olivella biplicata</i>		1
PO-A	Olive Snail	<i>Olivella pycna</i>		4
PO-A	Whelk	<i>Colus Bolus</i>		1
PO-A	Bigeye Amphipod	<i>Hyperia medusarum</i>		1
PO-A	Amphipod	<i>Atylus tridens</i>		2
PO-A	Amphipod	<i>Protomedeia sp.</i>		1
PO-A	Redrock Crab	<i>Cancer productus</i>	7	1
PO-A	Cancer Crab	<i>Cancer sp.</i>	5	1
PO-A	Isopod	<i>Idotea rescata</i>		1
PO-B	Male Dungeness Crab	<i>Metacarcinus magister</i>	86	1
PO-B	Male Dungeness Crab	<i>Metacarcinus magister</i>	71	1
PO-B	Male Dungeness Crab	<i>Metacarcinus magister</i>	78	1
PO-B	Female Dungeness Crab	<i>Metacarcinus magister</i>	84	1
PO-B	Female Dungeness Crab	<i>Metacarcinus magister</i>	77	1
PO-B	Female Dungeness Crab	<i>Metacarcinus magister</i>	82	1
PO-B	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	15	1
PO-B	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	11	1
PO-B	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	13	1
PO-B	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	11	1
PO-B	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	15	1
PO-B	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	14	1
PO-B	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	14	1

PO-B	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	10	1
PO-B	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	14	1
PO-B	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	13	1
PO-B	Shrimp	<i>Mysida Spp.</i>		607
PO-B	Shrimp	<i>Crangon Spp.</i>		984
PO-B	Amphipod	<i>Atylus tridens</i>		1
PO-B	Cancer Crab	Cancer sp.	9	1
PO-B	Cancer Crab	Cancer sp.	9	1
PO-B	Cancer Crab	Cancer sp.	7	1
PO-B	Isopod	<i>Gnorimosphaeroma oregonensis</i>		2
PO-B	Amphipod	<i>Microjassa sp.</i>		1
PO-B	Hermit Crab	<i>Pagurus sp.</i>		1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	86	1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	80	1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	80	1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	79	1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	118	1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	81	1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	46	1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	68	1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	76	1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	88	1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	80	1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	114	1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	73	1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	72	1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	71	1
PO-C	Male Dungeness Crab	<i>Metacarcinus magister</i>	72	1
PO-C	Female Dungeness Crab	<i>Metacarcinus magister</i>	71	1
PO-C	Female Dungeness Crab	<i>Metacarcinus magister</i>	84	1
PO-C	Female Dungeness Crab	<i>Metacarcinus magister</i>	80	1
PO-C	Female Dungeness Crab	<i>Metacarcinus magister</i>	81	1
PO-C	Female Dungeness Crab	<i>Metacarcinus magister</i>	76	1
PO-C	Female Dungeness Crab	<i>Metacarcinus magister</i>	88	1
PO-C	Female Dungeness Crab	<i>Metacarcinus magister</i>	72	1
PO-C	Female Dungeness Crab	<i>Metacarcinus magister</i>	70	1
PO-C	Female Dungeness Crab	<i>Metacarcinus magister</i>	77	1
PO-C	Female Dungeness Crab	<i>Metacarcinus magister</i>	88	1
PO-C	Female Dungeness Crab	<i>Metacarcinus magister</i>	78	1
PO-C	Female Dungeness Crab	<i>Metacarcinus magister</i>	88	1

PO-C	Female Dungeness Crab	<i>Metacarcinus magister</i>	83	1
PO-C	Female Dungeness Crab	<i>Metacarcinus magister</i>	84	1
PO-C	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	17	1
PO-C	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	17	1
PO-C	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	17	1
PO-C	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	12	1
PO-C	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	14	1
PO-C	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	13	1
PO-C	Juvenile Dungeness Crab	<i>Metacarcinus magister</i>	10	1
PO-C	Shrimp	Mysida Spp.		353
PO-C	Shrimp	Crangon Spp.		2434
PO-C	Amphipod	Atylus tridens		2
PO-C	Hermit Crab	Pagurus sp.		4

APPENDIX C
Field Trawl Data
Sheets

Epifaunal (Trawl) Sampling Log (Sheet 1 of)

ANAMAR
Environmental Consulting, Inc.

PROJECT: Port Orford

ANAMAR Environmental Consulting Inc.
1001 SW 5th Avenue, Suite 1100
Portland, Oregon 97204
Phone: 352-377-5770

Project #: 150006
Sample ID: PO-A-Trawl
Sampled By: ANAMAR, MS, USACE
Sample Date: 8/20/10

TRAWL SAMPLE COLLECTION INFORMATION

Collection Method:

Otter Trawl (Width of Trawl 125) Beam Trawl (Width of Trawl) Other
Stretch Mesh Size of Bag of Net 0.25 in (mm) Stretch Mesh Size of Front of Net: (mm/cm/inches) circle unit
Direction of Tow: N NE ✓ E S SE SW W NW

Tow Speed (knots): 1.9 Range of Tow Speed (knots):
Station Number: A This is Tow # 1 for this Station Length of Scope (feet): 200

Tow Start Time (When it Hits Seafloor): 1125 Tow End Time (When it Lifts Off Seafloor): 01128
Waypoint Start (When it Hits Seafloor): 001 (might be off) Waypoint End (When it Lifts Off Seafloor): 002

General Description of Tow Event:

Trawl Seemed to Contact Seafloor: Full Duration of Tow Portion of Tow Rarely Not At All
Problems with Gear: Bridle Tangled Doors Tangled/Inverted Cable Twisting Snagged on Obstruction Net Damaged

Notes on Tow/Gear Performance:

~44m east of largest island

Trawl performed well

ENVIRONMENTAL DATA

Ave. Water Depth (ft): 36 Range Water Depths (ft): Wind Speed (knots): 0-5 5-10 10-15 >15

Tidal Cycle: Low Mid High

Slack Incoming Outgoing

Sea State: Calm 1-2 ft 3-4 ft. 4-5 ft. >5 ft.

Water Temp (°F): 53

Weather: Sunny P. Cloudy Cloudy Rain (drizzle, mod, heavy) Foggy

Wet Weight Biomass (kg):

Weight of STINGRAY(S): Weight of SKATE(S): Weight of HORSESHOE CRAB(S):
Weight of ALL FISHES: Weight of ALL INVERTS: Weight [other(describe)]:

Specimens Retained in the Following Containers:

Type and Number: 5-gal. Bucket Bagged & Frozen Bagged & On Ice Other plastic jar
Preservative or Fixative Used: 10% Formalin ✓ % Ethanol NOTOXhisto

What Was Kept, and Why?: Invertebrates kept for identification in the lab

General Notes, Observations:

Wind variable, less than 5 kt
wave waves 2 ft or less
patchy fog

MS collected waypoints, also on back up gear

ANAMAR
Environmental Consulting, Inc.

[illegible]

Fish Measurements: Standard Length for Teleosts, Total Length for Sharks and Skates, Disk Width for Stingrays

Epifaunal (Trawl) Sampling Log (Sheet 1 of)

ANAMAR
Environmental Consulting, Inc.

PROJECT: Port Orford

ANAMAR Environmental Consulting Inc.
1001 SW 5th Avenue, Suite 1100
Portland, Oregon 97204
Phone: 352-377-5770

Project #: 15-0004b
Sample ID: PO-B-Trawl
Sampled By: ANAMAR, MT3, USACE
Sample Date: 8/20/16

TRAWL SAMPLE COLLECTION INFORMATION

Collection Method:

Otter Trawl (Width of Trawl 12') Beam Trawl (Width of Trawl) Other

Stretch Mesh Size of Bag of Net: 0.25 in (mm) Stretch Mesh Size of Front of Net: (mm/cm/inches) circle unit

Direction of Tow: N NE ✓ E S SE SW W NW

Tow Speed (knots): 2.1 Range of Tow Speed (knots):

Station Number: B This is Tow # 1 for this Station Length of Scope (feet): ~200

Tow Start Time (When it Hits Seafloor): 1233 Tow End Time (When it Lifts Off Seafloor): 1236

Waypoint Start (When it Hits Seafloor): 003 Waypoint End (When it Lifts Off Seafloor): 004

General Description of Tow Event:

Trawl Seemed to Contact Seafloor: Full Duration of Tow Portion of Tow Rarely Not At All

Problems with Gear: Bridle Tangled Doors Tangled/Inverted Cable Twisting Snagged on Obstruction Net Damaged

Notes on Tow/Gear Performance:

Trawl performed well

ENVIRONMENTAL DATA

Ave. Water Depth (ft): 47

Range Water Depths (ft):

Wind Speed (knots): 0-5 5-10 10-15 >15

Tidal Cycle: Low Mid High

Slack Incoming Outgoing

Wind Direction: N NE E SE S SW W NW

Sea State: Calm 1-2 ft 3-4 ft 4-5 ft >5 ft

Water Temp (°F): 53

Weather: Sunny P. Cloudy Cloudy Rain (drizzle, mod, heavy) Foggy

Wet Weight Biomass (kg):

Weight of STINGRAY(S): Weight of SKATE(S): Weight of HORSESHOE CRAB(S):

Weight of ALL FISHES: Weight of ALL INVERTS: Weight [other(describe)]:

Specimens Retained in the Following Containers:

Type and Number: 5-gal. Bucket Bagged & Frozen Bagged & On Ice Other plastic bag 16

Preservative or Fixative Used: 10% Formalin ✓ % Ethanol NOTOXhisto

What Was Kept, and Why?:

Invertebrates to be identified later

General Notes, Observations:

Waypoints collected by MT3 & on beach section

ANAMAR
Environmental Consulting, Inc.

[illegible]

Note any observations of ectoparasites, fin damage, lesions, and papilloma-like growths in fishes
Crustacean Measurements: Carapace Width for Crabs, Carapace Length (Post Orbital) for Shrimp
Mollusk Measurements: Valve Length for Clams and Scallops, Shell Length for gastropods
Fish Measurements: Standard Length for Teleosts, Total Length for Sharks and Skates, Disk Width for Stingrays

Epifaunal (Trawl) Sampling Log (Sheet 1 of __)

ANAMAR
Environmental Consulting, Inc.

PROJECT: Port Orford

ANAMAR Environmental Consulting Inc.
1001 SW 5th Avenue, Suite 1100
Portland, Oregon 97204
Phone: 352-377-5770

Project #: 15-0006
Sample ID: PO-C-Trawl
Sampled By: MTS ANAMAR, USACE
Sample Date: 8/20/16

TRAWL SAMPLE COLLECTION INFORMATION

Collection Method:

Otter Trawl (Width of Trawl 12') Beam Trawl (Width of Trawl _____) Other _____
Stretch Mesh Size of Bag of Net: 0.25" (mm) Stretch Mesh Size of Front of Net: _____ (mm/cm/inches) circle unit
Direction of Tow: N NE ☒ E S SE SW W NW
Tow Speed (knots): 1.9 Range of Tow Speed (knots): _____

Station Number: C This is Tow # 1 for this Station Length of Scope (feet): ~200
Tow Start Time (When it Hits Seafloor): 1326 Tow End Time (When it Lifts Off Seafloor): 1329
Waypoint Start (When it Hits Seafloor): 005 Waypoint End (When it Lifts Off Seafloor): 006

General Description of Tow Event:

Trawl Seemed to Contact Seafloor: ☒ Full Duration of Tow ☐ Portion of Tow ☐ Rarely ☐ Not At All
Problems with Gear: ☐ Bridle Tangled ☐ Doors Tangled/Inverted ☐ Cable Twisting ☐ Snagged on Obstruction ☐ Net Damaged

Notes on Tow/Gear Performance:

Trawl performed well

ENVIRONMENTAL DATA

Ave. Water Depth (ft): 59 Range Water Depths (ft): 57-59 Wind Speed (knots): 0-5 5-10 10-15 >15
Tidal Cycle: Low Mid ☒ High
Slack ☒ Incoming ☐ Outgoing
Wind Direction: N NE E SE S SW ☒ NW
Sea State: ☒ Calm ☒ 1-2 ft. ☐ 3-4 ft. ☐ 4-5 ft. ☐ >5 ft.
Water Temp (°F): 53 Weather: ☒ Sunny ☒ Partly Cloudy ☐ Cloudy ☐ Rain (drizzle, mod, heavy)

Wet Weight Biomass (kg):

Weight of STINGRAY(S): _____ Weight of SKATE(S): _____ Weight of HORSESHOE CRAB(S): _____
Weight of ALL FISHES: _____ Weight of ALL INVERTS: _____ Weight [other(describe)]: _____

Specimens Retained in the Following Containers:

Type and Number: 5-gal. Bucket _____ Bagged & Frozen _____ Bagged & On Ice _____ Other plastic
Preservative or Fixative Used: 10% Formalin ☒ % Ethanol _____ NOTOXhisto _____

What Was Kept, and Why?:

invertebrates + some fish kept for JD in the lab

General Notes, Observations:

Waypoints collected by MTS + on backup Garmin

Epifaunal Taxonomic Data Sheet (Sheet 1 of 1)

ANAMAR
Environmental Consulting, Inc.

Project #: Port Orford Sample ID: PO-C Trawl Sampled By: ANAMAR, USACE Sample Date: 8/20/16

Genus/species (SKIP LINES)	Lengths/Sexes of n = 10 (mm)	Total # Individuals Per Species	Photos/Kept?
Sand Dab	90, 127, 62, 69, 47 66, 112, 66, 71, 61 72, 65, 62, 47, 55 65,	(16)	
Sand sole	140, 35, 48, 46	(4)	
Starry Flounder	44	(1)	
Pacific Tomcod	70, 60, 59, 52, 51 69,	(6)	
Starry Grailfish	58, 38	(2)	
^{Poacher} Ricklebreast	39, 45, 40, 45, 33 47, 35, 39, 35, 32 39, 36, 34	(13)	
Sand Lance	75,	(1)	
Dungeness Crab - Male	86, 80, 80, 79, 118 81, 76, 68, 76, 88 80, 114, 73, 72, 71 72,	(16)	
Dungeness Crab - Female	71, 84, 80, 81, 76 88, 72, 70, 77, 88 78, 88, 83, 84,	(14)	
Dover Sole	61, 50, 61, 65, 46 72, 61, 35, 64, 46 68, 56, 43, 45, 58 45, 40, 52, 35, 44 35, 41, 27, 26, 23	(25)	

Note any observations of ectoparasites, fin damage, lesions, and papilloma-like growths in fishes

Crustacean Measurements: Carapace Width for Crabs, Carapace Length (Post Orbital) for Shrimp

Mollusk Measurements: Valve Length for Clams and Scallops, Shell Length for gastropods

Fish Measurements: Standard Length for Teleosts, Total Length for Sharks and Skates, Disk Width for Stingrays