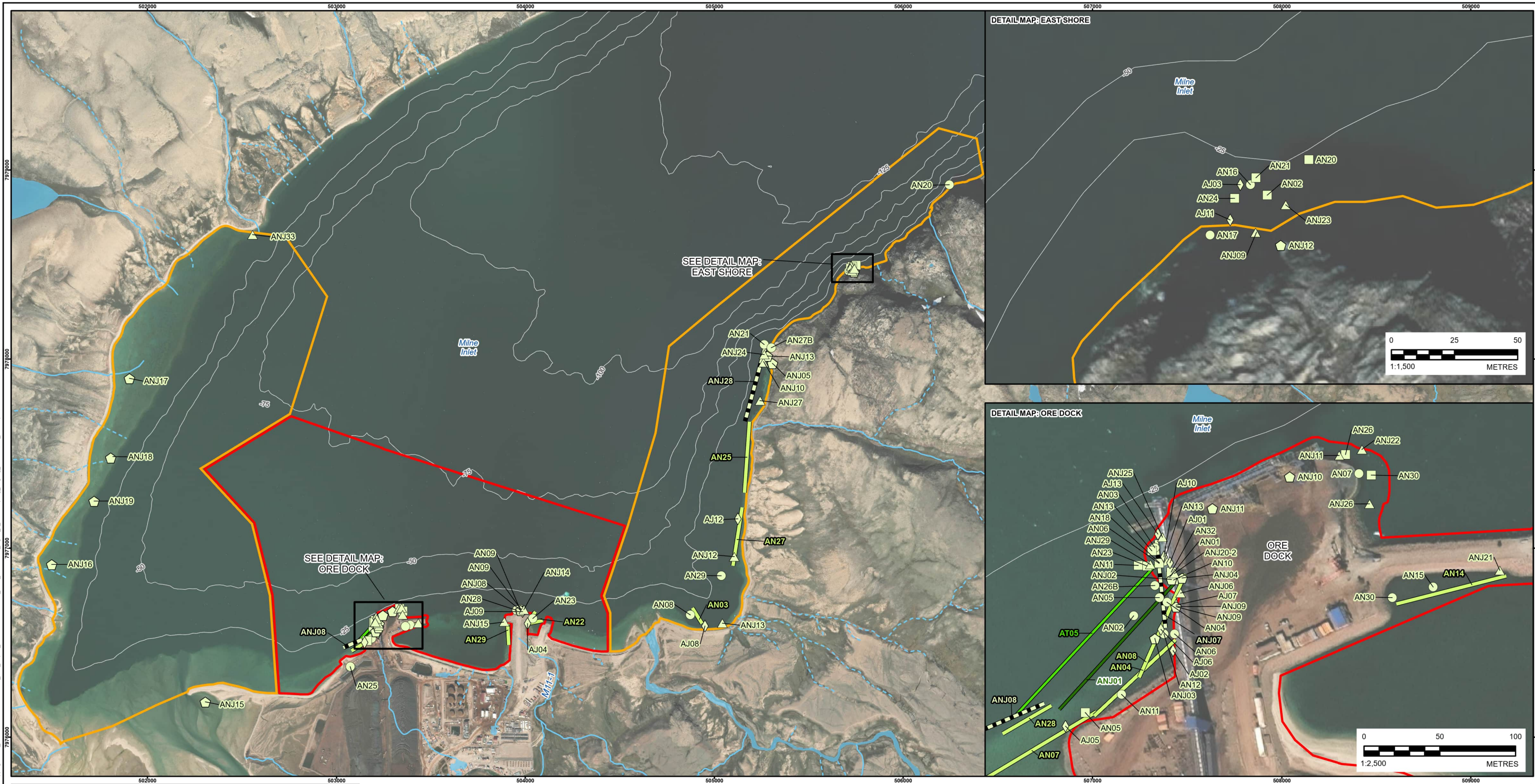


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- LEGEND**
- | | | | |
|--|--|--|-------------------------------------|
| | 2024 ANGLING (JIGGING) SAMPLING LOCATION | | BATHYMETRIC CONTOUR (25 M INTERVAL) |
| | 2023 ANGLING (JIGGING) SAMPLING LOCATION | | INTERMITTENT WATERCOURSE |
| | 2022 ANGLING (JIGGING) SAMPLING LOCATION | | WATERCOURSE |
| | 2021 ANGLING (JIGGING) SAMPLING LOCATION | | INDIRECT PROJECT FOOT PRINT (IPF) |
| | 2020 ANGLING (JIGGING) SAMPLING LOCATION | | DIRECT PROJECT FOOT PRINT (DPF) |
| | 2024 ANGLING (JIGGING) SAMPLING LOCATION | | WATERBODY |
| | 2023 ANGLING (JIGGING) SAMPLING LOCATION | | |
| | 2022 ANGLING (JIGGING) SAMPLING LOCATION | | |
| | 2021 ANGLING (JIGGING) SAMPLING LOCATION | | |

CLIENT
BAFFINLAND IRON MINES CORPORATION



CONSULTANT	YYYY-MM-DD	2025-04-08
	DESIGNED	BG
	PREPARED	AA
	REVIEWED	NO
	APPROVED	AL

REFERENCE(S)
BATHYMETRY CREATED BY GOLDER FROM MULTIPLE DATA SOURCES. FREIGHT DOCK DATA PROVIDED BY HATCH, MARCH 4, 2020. ADDITIONAL MILNE PORT INFRASTRUCTURE DATA OBTAINED FROM CLIENT, MAY 2, 2020 AND MAY 28, 2018. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. IMAGERY COPYRIGHT © 2024/0729, 2024/0718, 2023/0728 ESRI AND ITS LICENSORS. SOURCE: MAXAR VIVID AND EARTHSTAR GEOGRAPHICS. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

PROJECT
MARY RIVER PROJECT

TITLE
ANGLING (JIGGING) SAMPLE LOCATIONS IN MILNE PORT (2020 – 2024)

PROJECT NO.	CONTROL	REV.	FIGURE
CA0026371.6821	86000.04	0	D6-1



LEGEND

- 2024 GILLNET DEPLOYMENT LOCATION
- 2023 GILLNET DEPLOYMENT LOCATION
- 2022 GILLNET DEPLOYMENT LOCATION
- 2021 GILLNET DEPLOYMENT LOCATION
- 2020 GILLNET DEPLOYMENT LOCATION
- BATHYMETRIC CONTOUR (25 m INTERVAL)
- INTERMITTENT WATERCOURSE
- WATERCOURSE
- INDIRECT PROJECT FOOT PRINT (IPF)
- DIRECT PROJECT FOOT PRINT (DPF)
- WATERBODY

REFERENCE(S)

BATHYMETRY CREATED BY GOLDER FROM MULTIPLE DATA SOURCES. FREIGHT DOCK DATA PROVIDED BY HATCH, MARCH 4, 2020. ADDITIONAL MILNE PORT INFRASTRUCTURE DATA OBTAINED FROM CLIENT, MAY 2, 2020 AND MAY 28, 2018. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. IMAGERY COPYRIGHT © 2024/07/18 ESRI AND ITS LICENSORS. SOURCE: MAXAR VIVID. USED UNDER LICENSE, ALL RIGHTS RESERVED.

PROJECTION: UTM ZONE 17 DATUM: NAD 83

CLIENT

BAFFINLAND IRON MINES CORPORATION

PROJECT

MARY RIVER PROJECT

CONSULTANT



YYYY-MM-DD	2025-04-08
DESIGNED	BG
PREPARED	AA
REVIEWED	NO
APPROVED	AL

TITLE

GILL NET SAMPLE LOCATIONS IN MILNE PORT (2020 – 2024)

PROJECT NO.	CONTROL	REV.	FIGURE
CA0026317.6821	86000-04	0	D6-2

PATH: I:\GILLNETS\BAFFINLAND_IRON_MINES\CA0026317_6821_Iteration\Programs\2024\Maping\86000_MELP2024\MELP2024_Ch06_Report_Doc\2024\CA0026317_6821_MELP2024_EngDoc_2_FishSampling_GillNet_2020-2024_Rev0.aprx PRINTED ON: AT 12:38 PM

25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B



LEGEND

- ▲ 2024 HOOP NET DEPLOYMENT LOCATION
- ⬠ 2023 HOOP NET DEPLOYMENT LOCATION
- ◆ 2022 HOOP NET SAMPLING LOCATION
- 2021 HOOP NET SAMPLING LOCATION
- 2020 HOOP NET SAMPLING LOCATION
- BATHYMETRIC CONTOUR (25 m INTERVAL)
- - - INTERMITTENT WATERCOURSE
- WATERCOURSE
- ▭ INDIRECT PROJECT FOOT PRINT (IPF)
- ▭ DIRECT PROJECT FOOT PRINT (DPF)
- WATERBODY

REFERENCE(S)

BATHYMETRY CREATED BY GOLDER FROM MULTIPLE DATA SOURCES. FREIGHT DOCK DATA PROVIDED BY HATCH, MARCH 4, 2020. ADDITIONAL MILNE PORT INFRASTRUCTURE DATA OBTAINED FROM CLIENT, MAY 2, 2020 AND MAY 28, 2018. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED. IMAGERY COPYRIGHT © 2024/07/18 ESRI AND ITS LICENSORS. SOURCE: MAXAR VIVID. USED UNDER LICENSE, ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

0 250 500
1:15,000 METRES

CLIENT
BAFFINLAND IRON MINES CORPORATION

CONSULTANT


YYYY-MM-DD	2025-04-08
DESIGNED	BG
PREPARED	AA
REVIEWED	NO
APPROVED	AL

PROJECT
MARY RIVER PROJECT

TITLE
HOOP NET SAMPLE LOCATIONS IN MILNE PORT (2020 – 2024)

PROJECT NO. CA0026317.6821	CONTROL 86000-04	REV. 0	FIGURE D6-3
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25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Table 1: Length (mm) Summary Statistics from Catch Data by Taxon, Milne Port (2024)

Fishing Gear	Direct Project Footprint					Indirect Project Footprint				
	No. Fish Caught	Mean	SD	Min	Max	No. Fish Caught	Mean	SD	Min	Max
Arctic Alligatorfish	-	-	-	-	-	2	57.5	4.95	54	61
Trawling	-	-	-	-	-	2	57.5	4.95	54	61
Arctic Char	47	401.18	131.38	130	732	80	487	295.89	135	2630
Gill Net	46	406.41	128.08	130	732	80	487	295.89	135	2630
Hoop Net	1	171.00	-	171	171	-	-	-	-	-
Arctic Sculpin	-	-	-	-	-	2	197	74.95	144	250
Angling - Jigging	-	-	-	-	-	1	250	-	250	250
Hoop Net	-	-	-	-	-	1	144	-	144	144
Arctic Staghorn Sculpin	-	-	-	-	-	11	152.82	27.77	115	208
Angling - Jigging	-	-	-	-	-	5	165.4	32.30	121	208
Trawling	-	-	-	-	-	6	142.33	20.42	115	162
Atlantic Spiny Lumpsucker*	1	90.00	-	90	90	-	-	-	-	-
Trawling	1	90.00	-	90	90	-	-	-	-	-
Fourhorn Sculpin	271	214.82	39.84	111	314	108	252.59	28.84	195	309
Angling - Jigging	73	233.24	31.68	153	314	34	258.16	26.33	206	309
Gill Net	186	207.60	35.77	111	288	71	248.88	28.28	195	308
Hoop Net	12	211.17	32.42	159	260	3	237.67	40.05	202	281
Pacific Cod	21	553.75	67.79	411	670	2	564	106.07	489	639
Angling - Jigging	21	553.75	67.79	411	670	1	489	-	489	489
Gill Net	-	-	-	-	-	1	639	-	639	639
Ribbed Sculpin	1	71.00	-	71	71	9	97.38	28.76	50	135
Trawling	1	71.00	-	71	71	9	97.38	28.76	50	135
Shorthorn Sculpin	26	282.36	57.50	200	462	45	246.69	42.90	181	360
Angling - Jigging	26	282.36	557.50	200	462	35	245.10	45.62	181	360
Gill Net	-	-	-	-	-	10	252.149	19.39	225	272
Spatulate Sculpin	1	74.00	-	74	74	1	65	-	65	65
Trawling	1	74.00	-	74	74	1	65	-	65	65
Unidentified Cod	-	-	-	-	-	2	66	1.41	65	67
Trawling	-	-	-	-	-	2	66	1.41	65	67
Unidentified Sculpin	-	-	-	-	-	2	190.5	45.96	158	223
Angling - Jigging	-	-	-	-	-	1	223	-	223	223
Hoop Net	-	-	-	-	-	1	158	-	158	158

* Single Atlantic Spiny Lumpsucker specimen length in 2024 was estimated from photos due to specimen escape before metrics could be collected.

Table 2: Weight (g) Summary Statistics from Catch Data by Taxon, Milne Port (2024)

Fishing Gear	Direct Project Footprint					Indirect Project Footprint				
	No. Fish Caught	Mean	SD	Min	Max	No. Fish Caught	Mean	SD	Min	Max
Arctic Alligatorfish	-	-	-	-	-	2	1.47	0.34	1.229	1.713
Trawling	-	-	-	-	-	2	1.47	0.34	1.229	1.713
Arctic Char	47	1391.43	1339.68	20	5440	80	1694.61	1596.77	20	9063
Gill Net	46	1424.72	1339.46	20	5440	80	1694.61	1596.77	20	9063
Hoop Net	1	60.00	-	60	60	-	-	-	-	-
Arctic Sculpin	-	-	-	-	-	2	122.50	109.60	45	200
Angling - Jigging	-	-	-	-	-	1	200.00	-	200	200
Hoop Net	-	-	-	-	-	1	45.00	-	45	45
Arctic Staghorn Sculpin	-	-	-	-	-	11	54.14	40.72	17.312	130
Angling - Jigging	-	-	-	-	-	5	71.62	42.42	25	130
Trawling	-	-	-	-	-	6	31.26	16.38	17.312	50
Atlantic Spiny Lumpsucker*	1	-	-	-	-	-	-	-	-	-
Trawling	1	-	-	-	-	-	-	-	-	-
Fourhorn Sculpin	270	124.66	60.57	10	365.5	108	190.35	84.24	50	378.7
Angling - Jigging	72	135.09	57.78	40	365.5	34	194.50	77.58	80	378.7
Gill Net	186	103.17	52.40	10	200	71	179.72	83.83	50	355
Hoop Net	12	94.40	51.97	25	163	3	151.67	71.82	70	205
Pacific Cod	21	2056.10	817.36	640	3568	2	2035.00	954.59	1360	2710
Angling - Jigging	21	2056.10	817.36	640	3568	1	1360.00	-	1360	1360
Gill Net	-	-	-	-	-	1	2710.00	-	2710	2710
Ribbed Sculpin	1	<5.00	-	<5	<5	9	9.61	7.08	0.197	20
Trawling	1	<5.00	-	<5	<5	9	9.61	7.08	0.197	20
Shorthorn Sculpin	26	347.75	250.41	110	1170	45	230.32	120.05	65	590
Angling - Jigging	26	347.75	250.41	110	1170	35	229.44	128.63	65	590
Gill Net	-	-	-	-	-	10	219.29	40.25	150	260
Spatulate Sculpin	1	<5.00	-	<5	<5	1	2.77	-	2.768	2.768
Trawling	1	<5.00	-	<5	<5	1	2.77	-	2.768	2.768
Unidentified Cod	-	-	-	-	-	2	2.00	0.04	1.97	2.02
Trawling	-	-	-	-	-	2	2.00	0.04	1.97	2.02
Unidentified Sculpin	-	-	-	-	-	2	112.65	88.60	50	175.3
Angling - Jigging	-	-	-	-	-	1	175.30	-	175.3	175.3
Hoop Net	-	-	-	-	-	1	50.00	-	50	50

Note: Weights with '<5' were weighed in the field with a spring scale that does not register below 5g. Specimens with listed weights less than 5g were weighted in the lab.

* Single Atlantic Spiny Lumpsucker specimen weight could not be collected in 2024 due to specimen escape before metrics could be collected.

Table 3: Fish Catch Data for 2010 - 2024 MEEMP Fish Sampling Program (Combined Fishing Methods) in Milne Port

Family / Common Name	Taxonomic ID	Number of Fish Captured													
		2010	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Agonidae															
Arctic Alligatorfish	<i>Aspidophoroides olrikii</i>	0	0	0	0	0	0	0	0	0	2	0	4	2	
Atlantic Poacher	<i>Leptagonus decagonus</i>	0	0	0	0	0	0	0	0	0	1	0	0	0	
Ammodytidae															
Sandlance	<i>Ammodytes</i> spp. ¹	0	0	0	0	0	1	1	1	6	0	0	0	0	
Cottidae															
Atlantic Hookear Sculpin	<i>Artediellus atlanticus</i>	0	0	3	1	0	0	0	0	0	0	0	0	0	
Arctic Staghorn Sculpin	<i>Gymnocanthus tricuspis</i>	3	2	0	2	0	0	0	0	11	5	8	15	11	
Spatulate Sculpin	<i>Icelus spatula</i>	0	0	0	0	0	0	0	0	0	0	5	2	2	
Longhorn Sculpin	<i>Myoxocephalus octodecemspinosus</i>	0	0	4	2	2	0	0	0	0	0	0	0	0	
Fourhorn Sculpin	<i>Myoxocephalus quadricornis</i>	7	3	39	13	18	28	147	106	388	295	306	315	379	
Arctic Sculpin	<i>Myoxocephalus scorpioides</i>	0	0	4	1	0	6	3	0	13	47	5	2	2	
Shorthorn Sculpin	<i>Myoxocephalus scorpius</i>	50	4	10	8	18	21	78	66	74	37	31	16	71	
Ribbed Sculpin	<i>Triglops pingelii</i>	0	0	0	0	0	0	0	0	0	47	14	9	10	
Unidentified Sculpin	Cottidae indet.	0	0	0	12	0	0	3	0	84 ²	3	0	0	3	
Cyclopteridae															
Common Lumpfish	<i>Cyclopterus lumpus</i>	0	0	1	0	0	0	0	0	0	0	0	0	0	
Atlantic Spiny Lumpsucker	<i>Eumicrotremus spinosus</i>	0	0	0	0	0	0	0	0	0	0	0	1	1	
Gadidae															
Arctic Cod	<i>Arctogadus glacialis</i>	0	0	0	0	0	0	0	0	70	0	0	0	0	
Polar Cod	<i>Boreogadus saida</i>	0	0	0	0	0	0	1 ³	0	0	0	7	1	0	
Pacific Cod	<i>Gadus macrocephalus</i> ⁴	4	0	1	0	0	0	0	0	57	48	8	6	23	
Unidentified Cod	<i>Gadus</i> sp.	0	0	0	0	0	0	0	0	0	0	0	1 ⁵	0	
Unidentified Cod	Gadidae indet.	0	0	0	0	0	0	0	0	0	11	0	0	2 ⁵	
Gasterosteidae															
Ninespine Stickleback	<i>Pungitius pungitius</i>	0	0	0	0	0	0	0	1	0	0	0	0	0	
Liparidae															
Unidentified Snailfish ⁶	Liparidae indet.	0	0	0	0	0	0	0	0	0	1	0	0	0	
Salmonidae															

Family / Common Name	Taxonomic ID	Number of Fish Captured													
		2010	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	
Arctic Char	<i>Salvelinus alpinus</i>	11	6	3	67	157	23	169	105	148	105	98	49	127	
Stichaeidae															
Fourline Snakeblenny	<i>Eumesogrammus parecisus</i>	0	0	1	2	2	0	0	0	1	0	0	0	0	
Zoarcidae															
Halfbarred Pout	<i>Gymnelus hemifasciatus</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	
Fishdoctor	<i>Gymnelis viridis</i>	0	1	0	3	0	0	0	0	0	0	0	0	0	
Saddled Eelpout	<i>Lycodes mucosus</i>	0	0	0	0	0	0	0	0	0	1	1	1	0	
Indeterminate															
Unidentified Species	-	0	0	0	0	0	0	1	0	0	0	0	0	0	
Total Taxonomic Richness ⁷		5	5	9	9	5	5	6	5	9	11	11	12	10	
Total Fish Captures		75	16	67	111	197	79	403	279	852	603	484	422	633	

Note: Table does not include Fish Health Reference Area fish sampling catch numbers. See Appendix 6B for catch information.

¹ Both *Ammodytes hexapterus* and *A. dubius* occur in the Project Area but are difficult to resolve in the field. *Ammodytes* spp. represents observations for both species.

² For the Unidentified Sculpin captured in 2021, taxonomic lab results (Biologica) determined the majority of the fish to be in the genus *Myoxocephalus*. The species identification was unknown; however, results suggest it was potentially *M. aenaeus*. Nine of the unidentified sculpins were only able to be taxonomically identified to genus *Triglops*; results suggest it was potentially *T. pingelii*.

³ Fish species *Arctogadus glacialis* and *Boreogadus saida* both use the common name Polar Cod. The 2018 report (Golder 2019) indicated an Arctic Cod was captured, referred to as *A. glacialis*. Review of the catch record and field photographs indicate this was actually *B. saida* and was corrected in the 2020 MEEMP report (Golder 2021).

⁴ Recent taxonomic changes to the genus *Gadus* have combined species *G. ogac* (Greenland Cod) and *G. macrocephalus* (Pacific or Alaska Cod) under the umbrella term *G. macrocephalus*. A universal edit has been made to change Greenland cod (*G. ogac*) to Pacific Cod (*G. macrocephalus*).

⁵ For the Unidentified Cod captured in 2023, taxonomic lab results (Biologica) were determined to be in the genus *Gadus*. In 2024, taxonomic lab results were determined to be Family Gadidae.

⁶ Taxonomic lab results (Biologica) identified the 2021 Unidentified Snailfish from Genus *Liparis*. The species was determined to be either *L. gibbus* or *L. tunicatus*, however identifying features were not clear.

⁷ Taxa richness is based on known taxa, therefore 'unidentified' taxa were removed from the taxa richness calculation. This change was made in 2023, corrected for previous years, and subsequently carried forward.

Table 4: Total Fish Captured (n) for Grouped Taxon by Fishing Method, Year, and Fishing Area (2020 – 2024)

Fishing Method	Year	Fishing Area	Arctic Char	Fourhorn Sculpin	Pacific Cod	Shorthorn Sculpin	Other Sculpin	Other Fish	Area Total	Annual Total
Angling – Jigging	2020	DPF	1	145	38	36	4	0	224	250
		IPF	1	0	16	9	0	0	26	
	2021	DPF	5	135	33	11	26	0	210	260
		IPF	0	15	14	17	4	0	50	
	2022	DPF	0	132	1	4	0	0	137	157
		IPF	0	0	4	16	0	0	20	
	2023	DPF	1	34	5	5	0	0	45	69
		IPF	0	16	1	7	0	0	24	
	2024	DPF	0	73	0	0	21	26	120	197
		IPF	0	34	0	7	1	35	77	
Gill Net	2020	DPF	80	113	0	17	11	1	222	306
		IPF	64	15	0	5	0	0	84	
	2021	DPF	59	87	0	4	4	0	154	242
		IPF	41	39	1	5	2	0	88	
	2022	DPF	35	68	0	0	0	0	103	211
		IPF	62	42	0	3	1	0	108	
	2023	DPF	33	180	0	1	0	0	214	273
		IPF	15	43	0	0	1	0	59	
	2024	DPF	46	186	0	1	0	0	233	395
		IPF	80	71	0	0	1	10	162	
Hoop Net	2020	DPF	0	70	1	3	3	0	77	84
		IPF	1	3	2	0	1	0	7	
	2021	DPF	0	12	0	0	0	0	12	12
		IPF	0	0	0	0	0	0	0	
	2022	DPF	0	53	0	1	1	0	55	55
		IPF	0	0	0	0	0	0	0	
	2023	DPF	0	35	0	1	0	0	36	40
		IPF	0	4	0	0	0	0	4	
	2024	DPF	1	12	0	0	0	0	13	18
		IPF	0	3	0	2	0	0	5	
Trawling	2020	IPF	0	0	0	0	19	70	89	89
	2021	DPF	0	0	0	0	52	12	64	72
		IPF	0	0	0	0	4	4	8	
	2022	DPF	0	0	0	0	16	6	22	34
		IPF	0	0	0	0	11	1	12	
	2023	DPF	0	0	0	0	12	1	13	33
		IPF	0	0	0	0	14	6	20	
	2024	DPF	0	0	1	2	0	0	3	23
		IPF	0	0	4	16	0	0	20	

Note: DPF = Direct Project Footprint; IPF = Indirect Project Footprint. Table does not include Fish Health Reference Area fish sampling catch numbers. See Appendix 6B for catch information. Additionally, table does not contain discontinued fishing methods, which can be found in historical reports (e.g., WSP 2023).

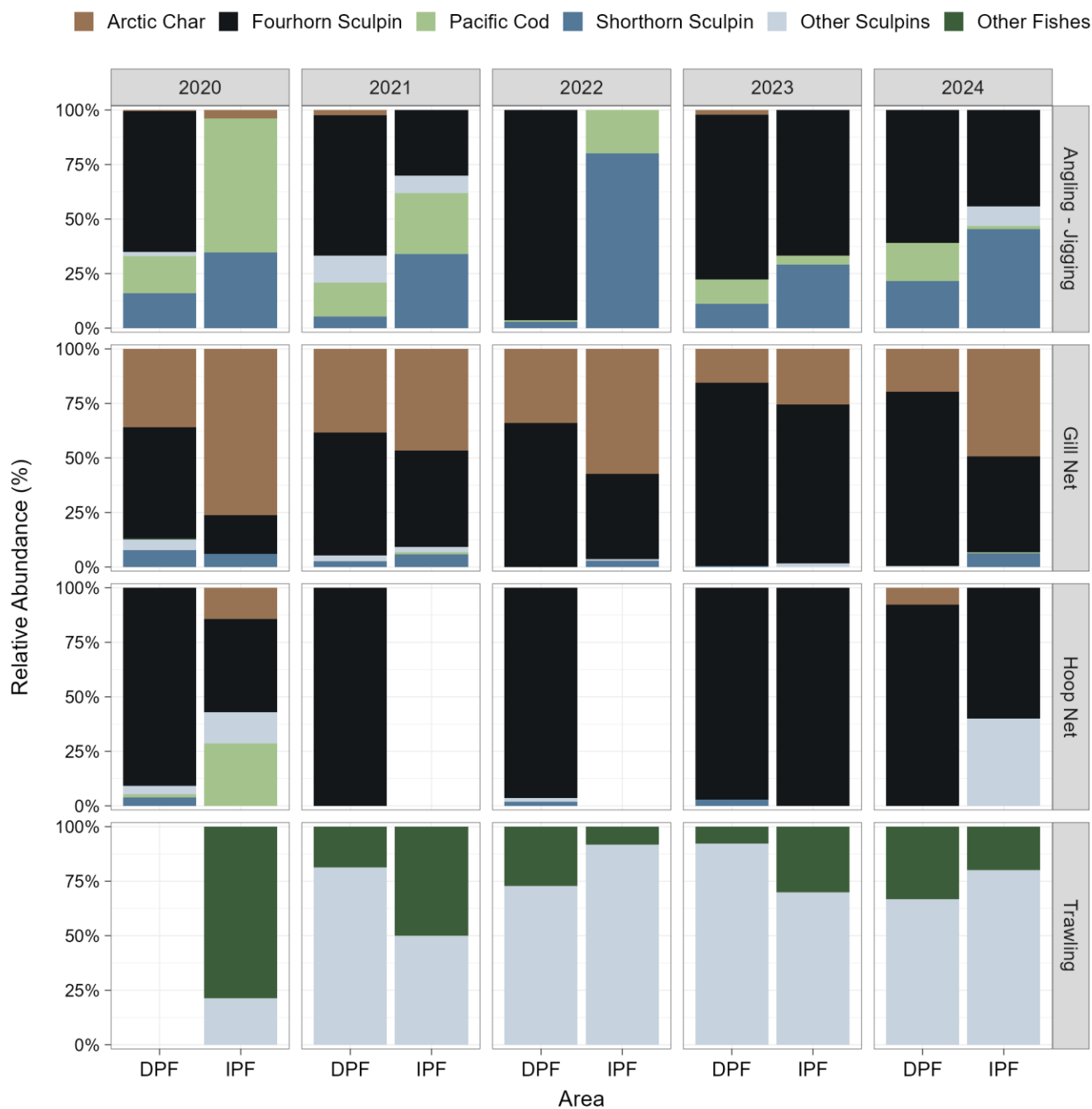


Figure 5: Relative Abundances of Grouped Taxa per Fishing Method and Fishing (2020-2024)

Note: DPF = Direct Project Footprint; IPF = Indirect Project Footprint. Taxa with abundances <5% were grouped as follows for all years in which they were present: other sculpins (Arctic Sculpin, Arctic Staghorn Sculpin, Ribbed Sculpin, Spatulate Sculpin, and unidentified sculpins) and other fishes (Arctic Alligatorfish, Arctic Cod, Atlantic Poacher, Atlantic Spiny Lumpsucker, Fourline Snakeblenny, Halfbarred Pout, Northern Sand Lance, Polar Cod, Saddled Eelpout, unidentified cods, and unidentified snailfish).

Table 5: Relative Abundances of Grouped Taxa by Fishing Method and Year (2020-2024)

Method ¹	Year	Arctic Char	Fourhorn Sculpin	Pacific Cod	Shorthorn Sculpin	Other Sculpin	Other Fish
Angling - Jigging	2020	1%	58%	22%	18%	2%	0%
	2021	2%	58%	18%	11%	12%	0%
	2022	0%	84%	3%	13%	0%	0%
	2023	1%	72%	9%	17%	0%	0%
	2024	0%	54%	11%	31%	4%	0%
Gill Net	2020	47%	42%	0%	7%	4%	0%
	2021	41%	52%	0%	4%	2%	0%
	2022	46%	52%	0%	1%	0%	0%
	2023	18%	82%	0%	0%	0%	0%
	2024	32%	65%	0%	3%	0%	0%
Hoop Net	2020	1%	87%	4%	4%	5%	0%
	2021	0%	100%	0%	0%	0%	0%
	2022	0%	96%	0%	2%	2%	0%
	2023	0%	98%	0%	2%	0%	0%
	2024	6%	83%	0%	0%	11%	0%
Trawling	2020	0%	0%	0%	0%	21%	79%
	2021	0%	0%	0%	0%	78%	22%
	2022	0%	0%	0%	0%	79%	21%
	2023	0%	0%	0%	0%	79%	21%
	2024	0%	0%	0%	0%	78%	22%

Note: DPF = Direct Project Footprint; IPF = Indirect Project Footprint. Taxa with abundances <5% were grouped as follows for all years in which they were present: other sculpins (Arctic Sculpin, Arctic Staghorn Sculpin, Ribbed Sculpin, Spatulate Sculpin, and unidentified sculpins) and other fishes (Arctic Alligatorfish, Arctic Cod, Atlantic Poacher, Atlantic Spiny Lumpsucker, Fourline Snakeblenny, Halfbarred Pout, Northern Sand Lance, Polar Cod, Saddled Eelpout, unidentified cods, and unidentified snailfish).

Table 6: Taxa Richness by Fishing Method (2020-2024)

Fishing Method	Number of Taxa				
	2020	2021	2022	2023	2024
Angling - Jigging	5	5	3	4	5
Gill Net	6	5	4	4	4
Hoop Net	5	1	3	2	3
Trawling	2	7	4	6	5
Total	9	11	11	12	10

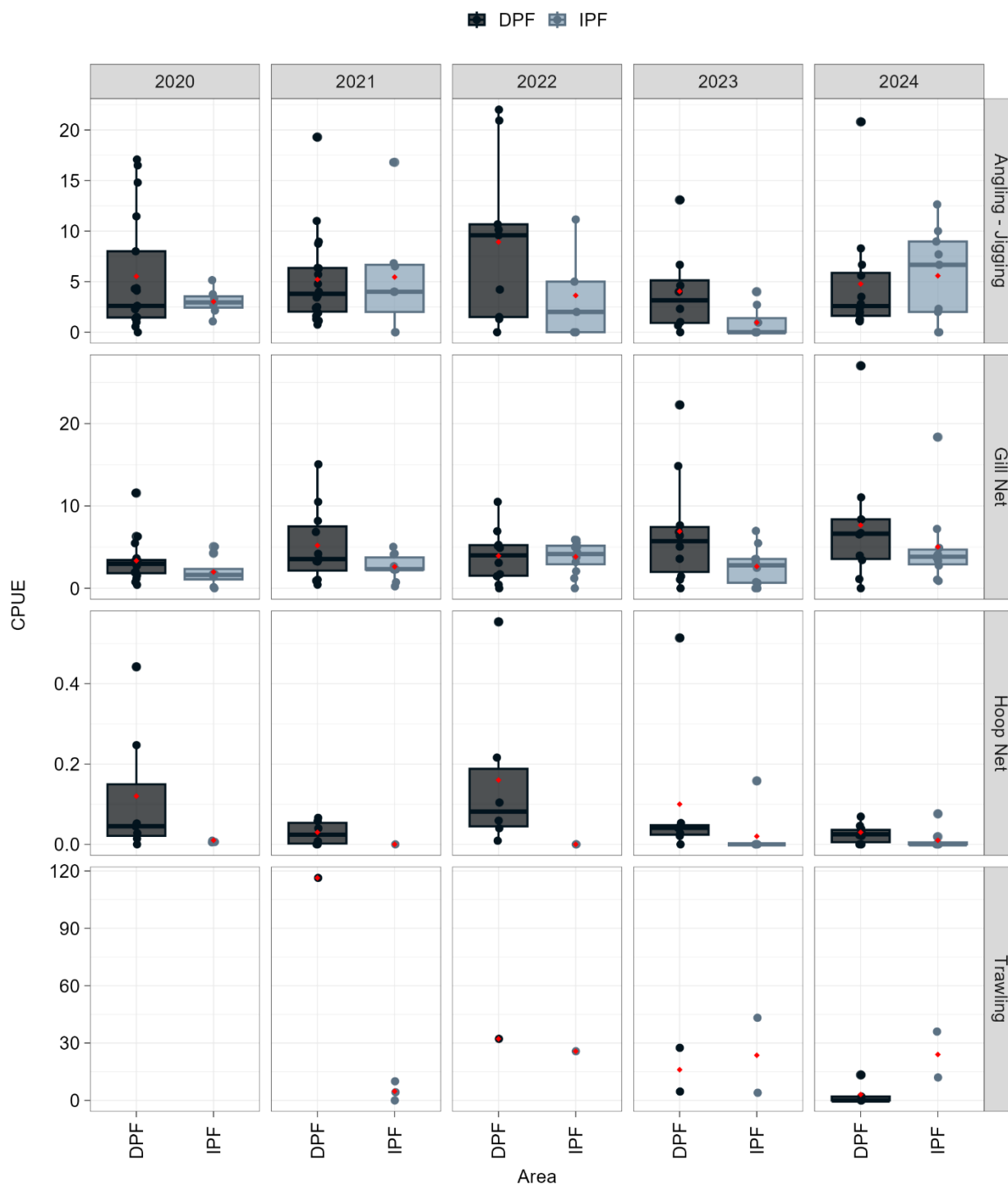


Figure 6: Average Catch-Per-Unit-Effort (CPUE) of Grouped Taxa per Fishing Method by Year (2020-2023) and Fishing Area

Note: Note: DPF = Direct Project Footprint; IPF = Indirect Project Footprint. Red diamonds indicate mean values. Trawling in 2020 was excluded from the figure due to high CPUE values that skewed the figure. Additionally, the figure does not contain discontinued fishing methods, which can be found in historical reports (e.g., WSP 2023).

Table 7: Catch Per Unit Effort Summary Statistics by Fishing Area, Fishing Method, and Year, All Fish Species Combined

Method (CPUE Unit)	Year	Area	Sampling Events	CPUE Summary Statistic				
				Mean	Median	SD	Min	Max
Angling – Jigging (fish*hr ⁻¹ *rod ⁻¹)	2020	DPF	17	5.52	2.60	5.81	0.00	17.07
		IPF	7	3.02	2.94	1.28	1.07	5.14
	2021	DPF	19	6.60	4.00	7.52	0.75	31.58
		IPF	7	5.45	4.00	5.71	0.00	16.80
	2022	DPF	9	8.92	9.58	8.18	0.00	22.00
		IPF	5	3.63	2.00	4.67	0.00	11.14
	2023	DPF	8	4.04	3.15	4.29	0.00	13.08
		IPF	8	0.96	0.00	1.55	0.00	4.00
	2024	DPF	12	4.77	2.58	5.57	1.075	20.80
		IPF	9	5.59	6.67	4.64	0.00	12.63
Gill Net (fish*hr ⁻¹ *100m ⁻¹)	2020	DPF	16	3.34	2.98	2.69	0.42	11.57
		IPF	9	7.14	1.70	15.60	0.00	48.49
	2021	DPF	11	5.20	3.55	4.54	0.44	15.06
		IPF	10	2.62	2.31	1.50	0.24	5.03
	2022	DPF	10	3.94	4.00	3.26	0.00	10.49
		IPF	12	3.83	4.16	1.89	0.00	5.90
	2023	DPF	10	6.91	5.72	6.88	0.00	22.27
		IPF	10	2.65	2.80	2.36	0.00	6.97
	2024	DPF	10	7.66	6.62	7.62	0.00	27.02
		IPF	10	5.03	3.83	5.02	0.89	18.36
Hoop Net (fish/hr)	2020	DPF	7	0.12	0.05	0.17	0.00	0.44
		IPF	4	0.01	0.01	0.00	0.01	0.01
	2021	DPF	6	0.03	0.02	0.03	0.00	0.07
		IPF	1	0.00	0.00	-	0.00	0.00
	2022	DPF	6	0.16	0.08	0.20	0.01	0.55
		IPF	3	0.00	0.00	0.00	0.00	0.00
	2023	DPF	7	0.10	0.04	0.18	0.00	0.51
		IPF	7	0.02	0.00	0.06	0.00	0.16
	2024	DPF	10	0.03	0.03	0.02	0.00	0.069
		IPF	8	0.02	0.00	0.03	0.00	0.076
Trawling (fish/hr)	2020	IPF	1	333.75	333.75	-	333.75	333.75
	2021	DPF	1	116.36	116.36	-	116.36	116.36
		IPF	3	4.76	4.29	5.02	0.00	10.00
	2022	DPF	1	32.20	32.20	-	32.20	32.20
		IPF	1	25.71	25.71	-	25.71	25.71
	2023	DPF	2	16.06	16.06	16.18	4.62	27.50
		IPF	2	23.60	23.60	27.72	4.00	43.20
	2024	DPF	5	3.07	0.00	5.80	0.00	13.33
		IPF	2	24.00	24.00	16.97	12.00	36.00

Note: Note: DPF = Direct Project Footprint; IPF = Indirect Project Footprint; SD = Standard deviation.

Table 8: Statistical Testing Results for CPUE of All Fish Species Combined, Arctic Char, and Fourhorn Sculpin for Select Fishing Methods (2020-2024).

Taxon	Model			
	Variable	Chi square	Df	P value
All Species Combined	Angling – Jigging			
	Area	3.877	1	0.049
	Year	7.660	4	0.105
	Area:Year	4.975	4	0.290
	Gill Net			
	Area	9.581	1	0.002
	Year	12.657	4	0.013
	Area:Year	3.474	4	0.473
	Hoop Net			
	Area	23.822	1	<0.001
	Year	13.048	4	0.011
	Area:Year	Not included in the model		
Arctic Char	Gill Net			
	Area	0.005	1	0.945
	Year	8.786	4	0.067
	Area:Year	14.945	4	0.005
Fourhorn Sculpin	Angling – Jigging			
	Area	6.918	1	0.009
	Year	3.087	4	0.543
	Area:Year	Not included in the model		
	Gill Net			
	Area	23.320	1	<0.001
	Year	12.617	4	0.013
	Area:Year	1.691	4	0.792
	Hoop Net			
	Area	31.841	1	<0.001
	Year	11.967	4	0.018
	Area:Year	Not included in the model		

Note: Cells highlighted **blue** indicate statistically significant results (p-value <0.05). Area includes DPF (Direct Project Footprint) and IPF (Indirect Project Footprint). Df = degrees of freedom.

Table 9: Grouped Taxa Mean Catch Per Unit Effort by Fishing Method, Fishing Area, and Year (2020-2024)

Method (CPUE Unit)	Year	Area	Arctic Char	Fourhorn Sculpin	Pacific Cod	Shorthorn Sculpin	Other sculpins	Other fishes
Angling – Jigging (fish*hr ⁻¹ *rod ⁻¹)	2020	DPF	0.04	2.62	0.97	1.76	0.13	0.00
		IPF	0.15	0.00	1.26	1.61	0.00	0.00
	2021	DPF	0.18	4.09	1.12	0.39	0.81	0.00
		IPF	0.00	0.95	2.46	1.79	0.25	0.00
	2022	DPF	0.00	8.31	0.12	0.50	0.00	0.00
		IPF	0.00	0.00	0.80	2.83	0.00	0.00
	2023	DPF	0.10	2.95	0.41	0.58	0.00	0.00
		IPF	0.00	0.71	0.12	0.13	0.00	0.00
Gill Net (fish*hr ⁻¹ *100m ⁻¹)	2020	DPF	1.10	1.82	0.00	0.24	0.17	0.01
		IPF	5.36	1.37	0.00	0.42	0.00	0.00
	2021	DPF	2.13	2.75	0.00	0.20	0.13	0.00
		IPF	1.29	1.13	0.02	0.13	0.05	0.00
	2022	DPF	1.22	2.72	0.00	0.00	0.00	0.00
		IPF	2.08	1.50	0.00	0.20	0.05	0.00
	2023	DPF	1.23	5.66	0.00	0.03	0.00	0.00
		IPF	0.76	1.87	0.00	0.00	0.02	0.00
Hoop Net (fish/hr)	2020	DPF	0.00	0.11	<0.01	0.01	<0.01	0.00
		IPF	<0.01	<0.01	<0.01	0.00	<0.01	0.00
	2021	DPF	0.00	0.03	0.00	0.00	0.00	0.00
		IPF	0.00	0.00	0.00	0.00	0.00	0.00
	2022	DPF	0.00	0.15	0.00	0.01	<0.01	0.00
		IPF	0.00	0.00	0.00	0.00	0.00	0.00
	2023	DPF	0.00	0.10	0.00	<0.01	0.00	0.00
		IPF	0.00	0.02	0.00	0.00	0.00	0.00
Trawling (fish/hr)	2020	DPF	<0.01	0.02	0.00	0.00	0.00	0.00
		IPF	0.00	0.01	0.00	0.00	0.01	0.00
	2021	DPF	0.00	0.00	0.00	0.00	71.25	262.50
		IPF	0.00	0.00	0.00	0.00	94.55	21.82
	2022	DPF	0.00	0.00	0.00	0.00	2.29	2.48
		IPF	0.00	0.00	0.00	0.00	23.41	8.78
	2023	DPF	0.00	0.00	0.00	0.00	23.57	2.14
		IPF	0.00	0.00	0.00	0.00	14.81	1.25
Trawling (fish/hr)	2024	DPF	0.00	0.00	0.00	0.00	16.60	7.00
		IPF	0.00	0.00	0.00	0.00	1.73	1.33
	2020	DPF	0.00	0.00	0.00	0.00	20.00	4.00
		IPF	0.00	0.00	0.00	0.00		

Note: Note: DPF = Direct Project Footprint; IPF = Indirect Project Footprint. Taxa with abundances <5% were grouped as follows for all years in which they were present: other sculpins (Arctic Sculpin, Arctic Staghorn Sculpin, Ribbed Sculpin, Spatulate Sculpin, and unidentified sculpins) and other fishes (Arctic Alligatorfish, Arctic Cod, Atlantic Poacher, Atlantic Spiny Lumpsucker, Fourline Snakeblenny, Halfbarred Pout, Northern Sand Lance, Polar Cod, Saddled Eelpout, unidentified cods, and unidentified snailfish).

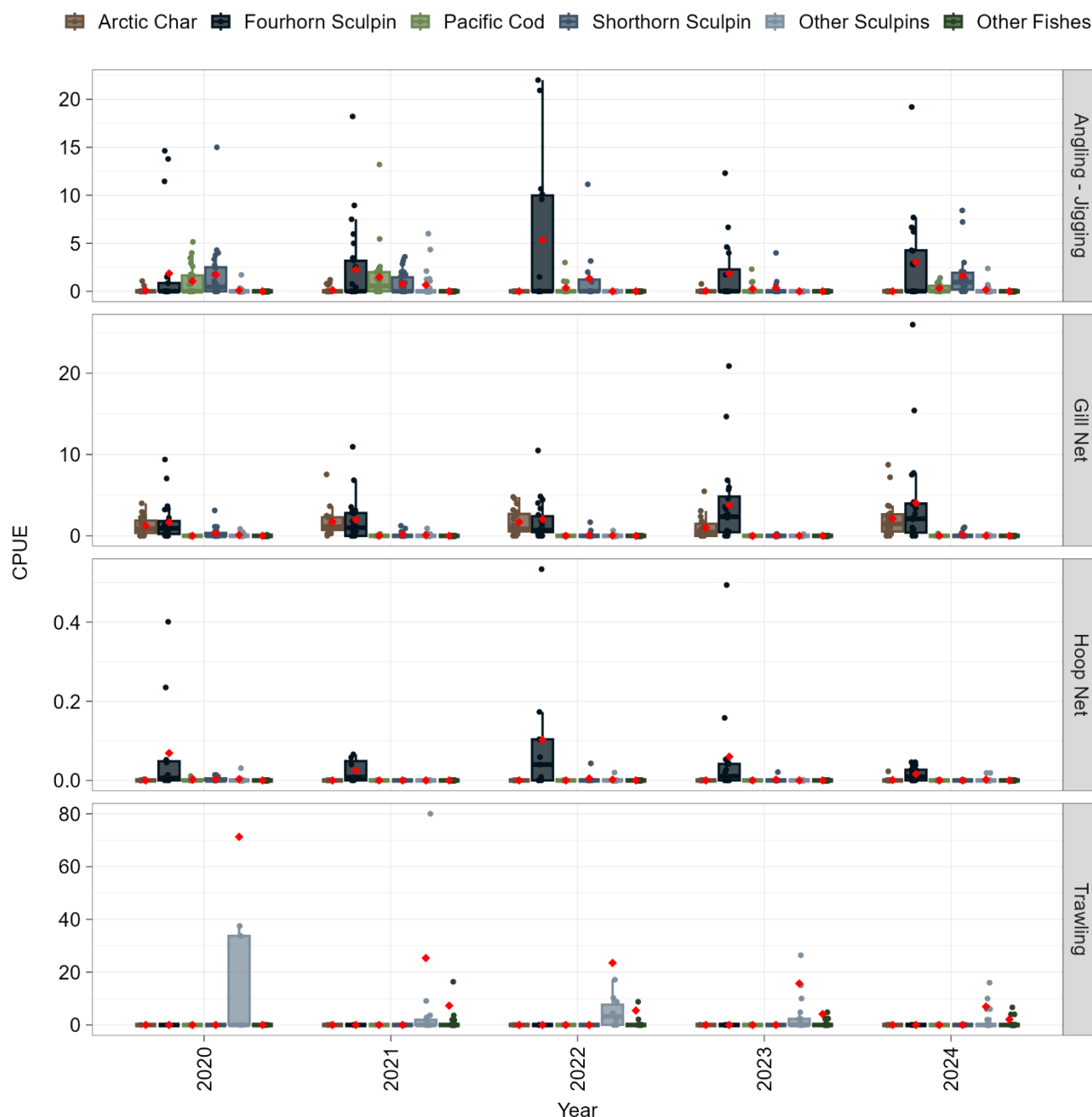


Figure 7: Grouped Taxa Mean Catch Per Unit Effort by Fishing Method (2020-2024)

Note: Red diamonds indicate mean values. Taxa with abundances <5% were grouped as follows for all years in which they were present: other sculpins (Arctic Sculpin, Arctic Staghorn Sculpin, Ribbed Sculpin, Spatulate Sculpin, and unidentified sculpins) and other fishes (Arctic Alligatorfish, Arctic Cod, Atlantic Poacher, Atlantic Spiny Lumpsucker, Fourline Snakeblenny, Halfbarred Pout, Northern Sand Lance, Polar Cod, Saddled Eelpout, unidentified cods, and unidentified snailfish). High outlier values were removed from jigging in 2021 DPF, gill net 2020 IPF, and trawling 2020 IPF for better visualization.

APPENDIX 6E

Power Analysis

POWER ANALYSIS – FISH COMMUNITY CPUE

This section presents the results of a power analysis undertaken for the 2020 to 2024 fish community program in support of the catch-per-unit-effort (CPUE) statistical analyses.

METHODS

A Type I error is concluding there is a significant effect when none exists (i.e., a false positive). Alpha (α) is the probability of committing a Type I error. A Type II error is the probability of concluding there is no significant effect when there is a real effect of some specified magnitude (i.e., a false negative). Beta (β) is the probability of committing a Type II error. The power of a statistical test ($1 - \beta$) is the probability of detecting a real effect.

In this analysis, the Type I error-rate (α), also referred to as the significance level, was set to 0.05. The desired minimum statistical power was 80%, which corresponds to a type II error-rate of 0.2. Power analyses were conducted to assess the power of statistical tests under three effect sizes – detection of a reduction of 20%, 30%, and 40% in catch per unit effort in the DPF relative to the IPF area in 2024. A range of sample sizes was assessed for each gear type, to evaluate whether increasing effort within the logistical constraints associated with the sampling would result in sufficient (>80%) statistical power.

Data Simulation following Effect Size Application

The power to detect statistically significant effects was estimated using residual bootstrapping in R v. 4.4.2 (R 2024), following the approach of Fox and Weisberg (2018). The general approach was to simulate data based on the model selected for interpretation, the observed sample size (or the sample size of choice), and the variability estimated by the original model, and re-run the models that were used for the original analysis using the simulated data. The data simulation and analysis were repeated 5,000 times, and the proportion of repetitions where the *P*-values of interest were significant ($P < 0.05$) was interpreted as the statistical power of the test.

To produce simulated data, the original model was used to predict values of the response variable, and the dispersion estimated by the original negative binomial model were calculated and retained. The predicted values were then adjusted according to the effect size, depending on analysis (see below for details). For each iteration of the simulation, the adjusted predicted values and the dispersion from the original model were used to generate a randomly drawn sample of negative binomial counts, to produce a set of simulated data. Generating the randomly drawn sample around the effect size-adjusted predictions was done to create a level of variability in the simulated data that was similar to the observed data. The simulated data were then analyzed using the same model structure as the original analysis.

In the analysis of 2020 to 2024 data, the question of interest was a reduction in fish CPUE between DPF and IPF in 2024. That is, the power to detect the interaction between fishing area (FA) and sampling year needed to be assessed. In addition, the power of the multiple comparisons between FAs within year was of interest, specifically for the comparison between areas in 2024, where the effect sizes were applied. The effect was applied as percentage relative to the values predicted for the IPF in 2024. That is, an increasing effect size resulted in a larger difference between the IPF and DPF areas in 2024.

The power to detect a significant main effect of year on an interaction between year and area was assessed, as well as the power to detect a difference between previous years and 2024 in the subsequent multiple comparisons. The effect was applied as percentage relative to the values predicted for 2024. The simulated data

were analyzed using the same model as the original analysis described in the main report, and the *P*-values for the effects of interest were retained, which included both the main effect of area and an interaction with area (for models that included an interaction). If any of these *P*-values were less than 0.05, it was considered a statistically significant result. The proportion of repetitions with *P*-values less than 0.05 was interpreted as the statistical power of the overall regression for that effect size. In addition to the power to detect the interaction between year and area (for models that included an interaction), the power to detect a difference between areas 2024 in the subsequent multiple comparisons was also calculated, where if the *P*-value of the comparison between the IPF and DPF in 2024 was less than 0.05, the comparison was considered significant. For models that did not include an interaction between FA and sampling year due to lack of captured fish in some years in the IPF, multiple comparison power was assessed for comparisons between years, where if the *P*-value of the comparison between each previous year and 2024 was less than 0.05, the comparison was considered significant. The power analysis was performed on three effect sizes – CPUE reductions of 20%, 30%, and 40% relative to the IPF, and a range of sample sizes, depending on fishing gear.

Power Analysis – Reporting of Results

Power curves were produced, showing statistical power as a function of sample size and effect size in percentages. Horizontal lines were added to visualize statistical power values of 0.8 (hereafter sufficient power) and 0.9 (hereafter high power), and the observed effect size was provided in the results.

RESULTS

For the analyses of CPUE, only the analyses of hoop net data (all species and Fourhorn Sculpin) had sufficient power to detect the assessed effects given the evaluated sample sizes (Figure 1). Both of these were models without an interaction; for both, the observed annual sample sizes were sufficient to detect a 20% reduction in CPUE relative to 2023. The high statistical power under observed effect and sample sizes for hoop net sampling (both all species and Fourhorn Sculpin (Figure 1) was due to large interannual differences prior to 2023–2024; that is, power to detect an overall year effect was high regardless of the simulated effect sizes.

None of the remaining models had sufficient power to detect a significant effect of year (Fourhorn Sculpin, angling-jigging) or a significant interaction between year and FA (all other models) under any of the assessed sample sizes and effect sizes (Figure 1). None of the multiple comparisons, for all models, had sufficient statistical power to detect a significant post-hoc comparison – whether a comparison between IPF and DPF in 2024 (for models with an interaction; Figure 2) or a comparison between 2023 and 2024 (for models without an interaction; Figure 3).

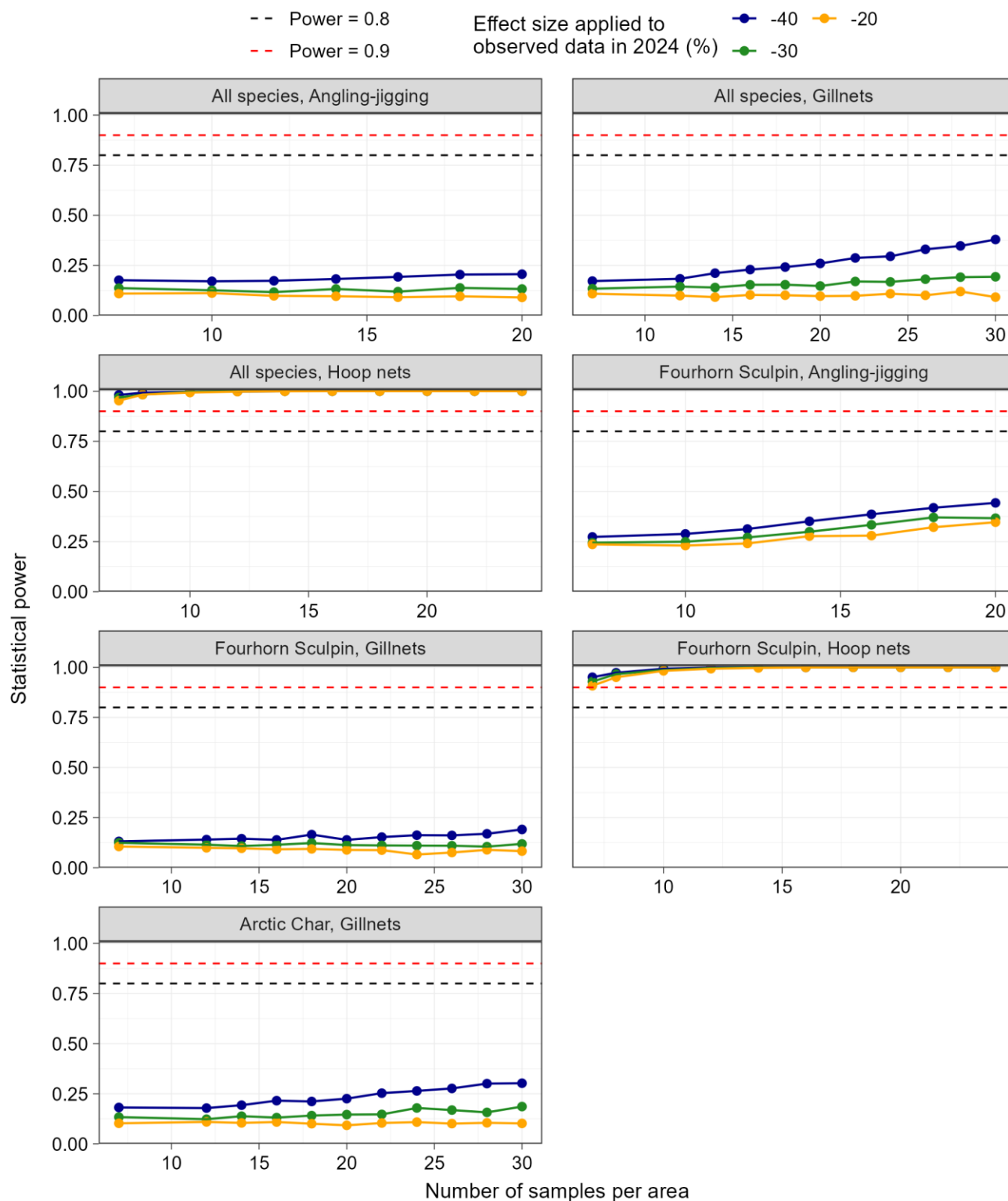


Figure 1: Statistical power of the models of fish CPUE to detect a significant interaction between FA and year (for models with an interaction) or a main effect of year (for models without an interaction), based on CPUE data collected in 2020 to 2024. The first point on each panel shows power given the observed annual sampled sizes.

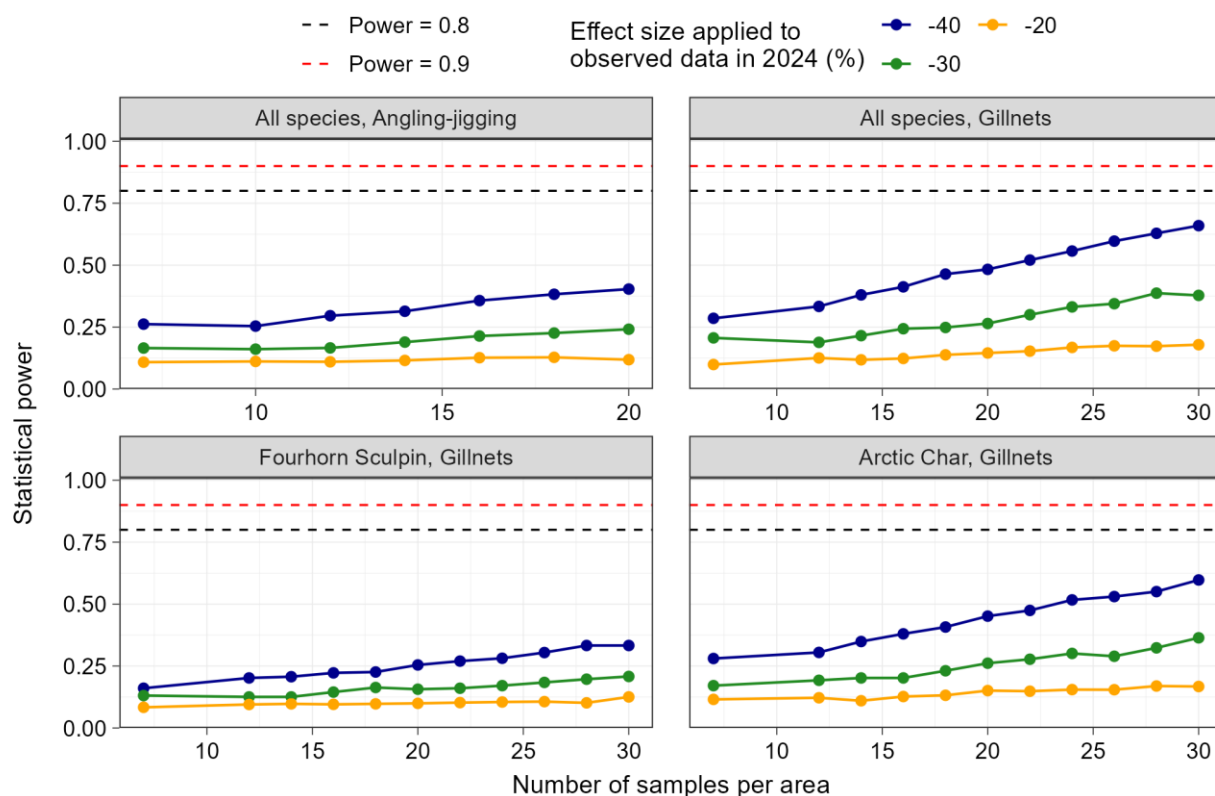


Figure 2: Statistical power of the models of fish CPUE for all species combined to detect a significant post-hoc comparison between IPF and DPF in 2024 (for models with an interaction).

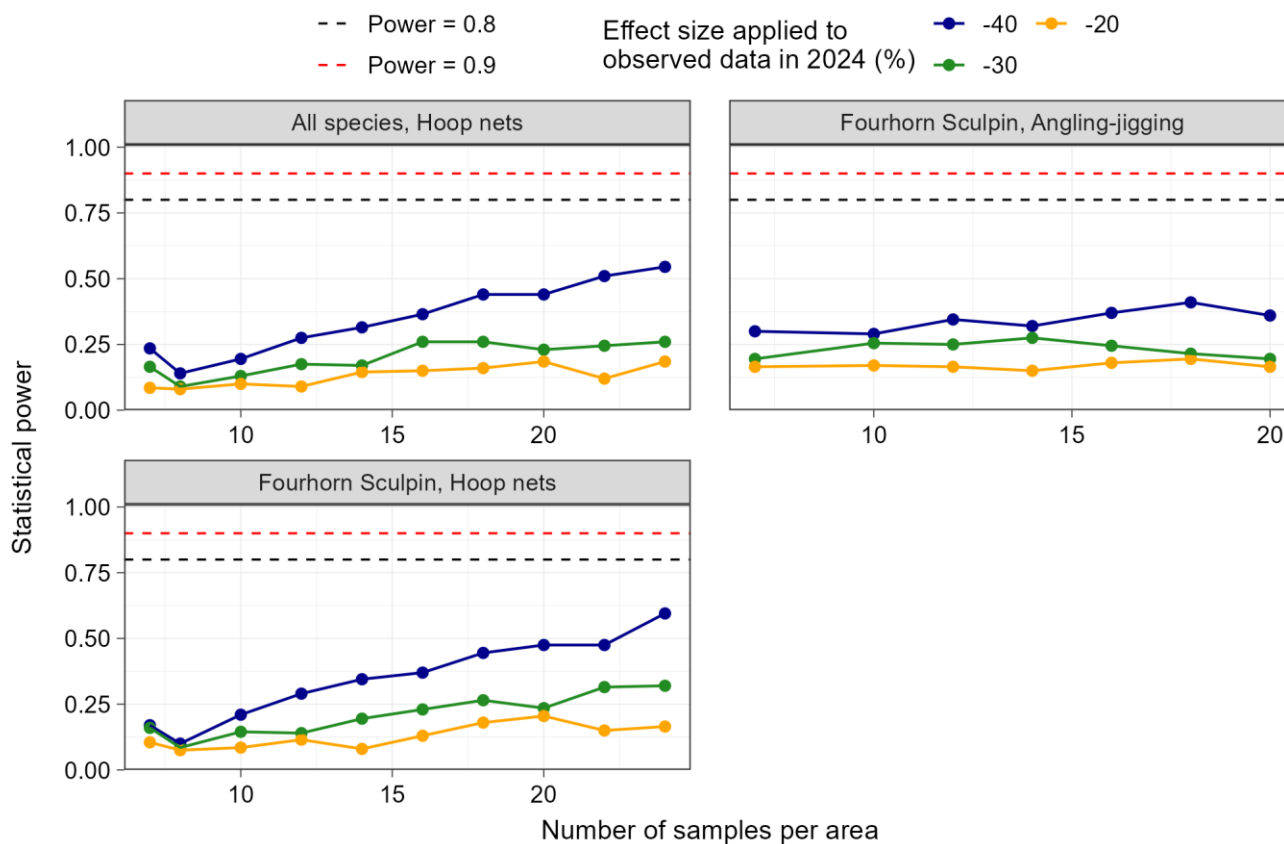


Figure 3: Statistical power of the models of fish CPUE for all species combined to detect a significant post-hoc comparison between 2023 and 2024 (for models without an interaction).

The observed effect sizes for the analyzed CPUE data ranged from -80 (for all species and Fourhorn Sculpin in 2021–2022 hoop nets) +464 (for Fourhorn Sculpin sampled in gillnets in 2022/2020; Table 1). While observed effect sizes were often large, sample sizes in the dataset were often small and inconsistent between years and areas. For example, 17 angling-jigging sampling events took place at the DPF in 2020, but only seven in the IPF in 2020, and only five in the IPF in 2022. The inconsistency in sample size likely reduced the statistical power of the analysis for the all-species-combined dataset. The large differences in annual differences between IPF and DPF for Arctic Char (Table 1) resulted in the only significant interaction found in the original analyses.

The low power to detect a significant interaction was due to three main causes –

- 1) data variability,
- 2) low CPUE in the IPF, relative to which the reduction was being simulated, and
- 3) the lack of support for an FA-year interaction within previous years (hence requiring a very large difference in 2024 to make the overall interaction significant)

On the other hand, the high power to detect a significant effect of year in the two hoop net models, even under observed effect sizes, was driven by differences in CPUE in 2020 and 2022 sampling years. For example, hoop net data for all species combined had low CPUE values in 2021 and 2023 and high CPUE values in 2020 and 2022, leading to an existing difference between years, regardless of the effect size simulated in 2023–2024.

Table 1: Observed effect sizes for analyses of fish CPUE data from 2020-2023.

Species	Gear	Observed effect sizes (%)				
		2020	2021	2022	2023	2024
All fish combined	Angling-jigging (DPF – IPF)	90	20	146	218	-17
	Gill nets (DPF – IPF)	74	99	4	176	52
	Hoop nets	Range from -80 (2021–2022) to +297 (2020–2023)				
Fourhorn Sculpin	Angling-jigging	Range from -72 (2020–2024) to +61 (2022–2023)				
	Gill nets (DPF – IPF)	464	143	139	219	294
	Hoop nets	Range from -80 (2021–2022) to +361 (2022–2023)				
Arctic Char	Gill nets (DPF – IPF)	-25	67	-37	415	-54

SUMMARY

Overall, statistical power to detect an interaction between year and FA was low, while power to detect an overall year effect (for two of the three models that did not include an interaction) was high. Across all models, including cases where power was sufficient to detect the overall interaction or main effects, there was not sufficient power to detect a post-hoc difference between FAs in 2024 (for models with interaction) or between 2023 and 2024 (for models without an interaction).

Implications of Power Analysis Results

Overall, the results of the power analysis presented here indicate that analyses of fish CPUE data often had low power despite efforts to increase overall sampling size and equalize the sample sizes between the two FAs. Given the low statistical power, going forward, it is recommended differences between FAs should be assessed using effect sizes rather than a strict adherence to statistical significance.

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