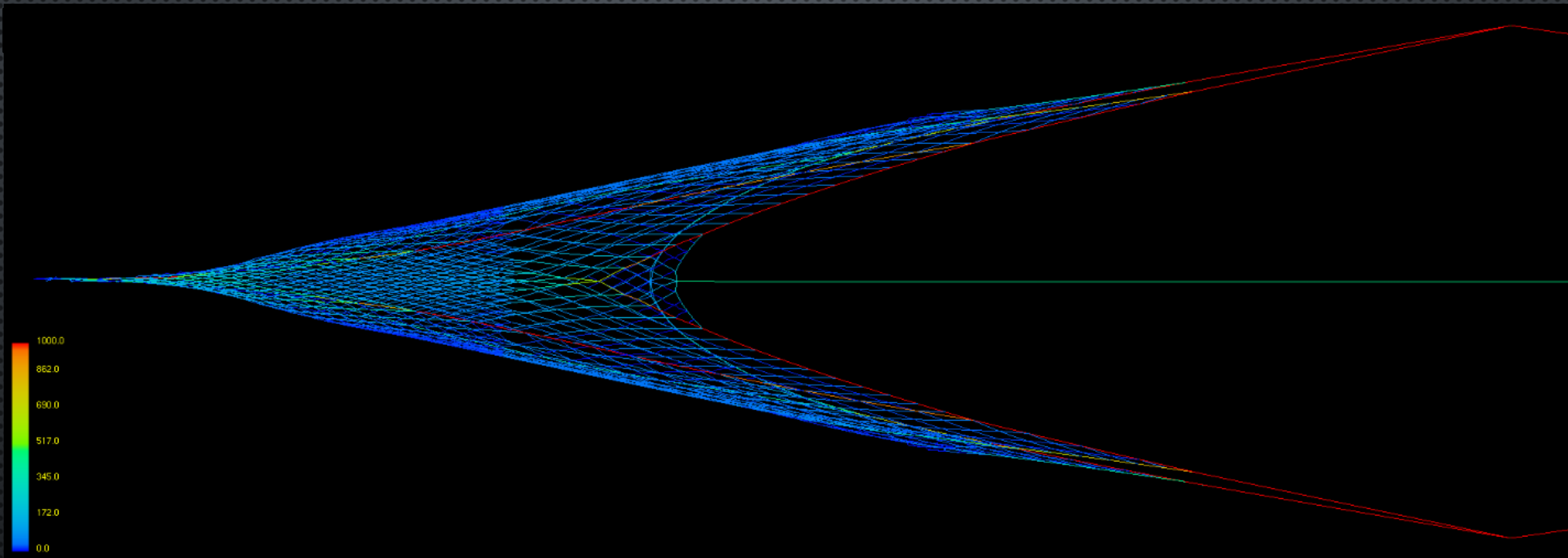


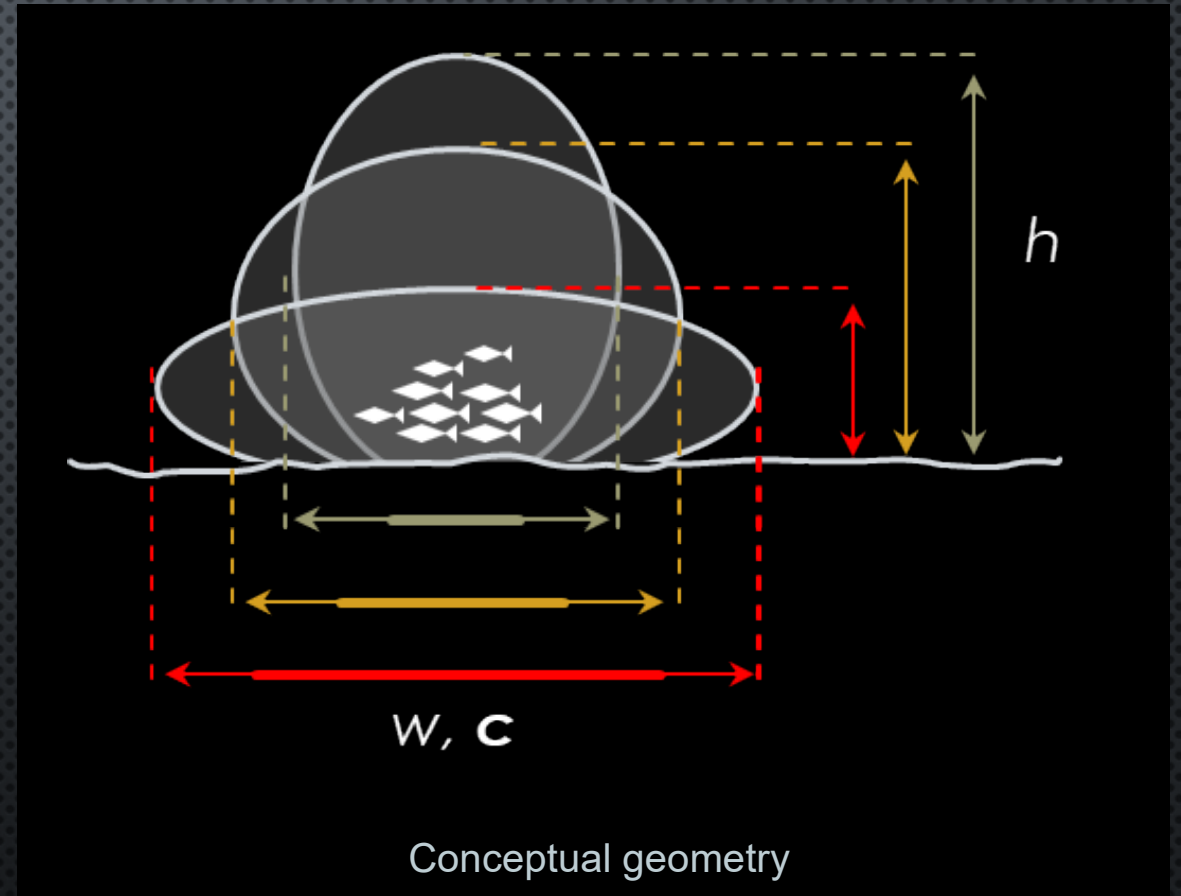
STATE OF THE TECHNOLOGY – FISHING GEAR RESEARCH



FISHING GEAR RESEARCH

Harvest depends on encounter between target fish and the gear.

Gear Position and shape determine encounter opportunity.

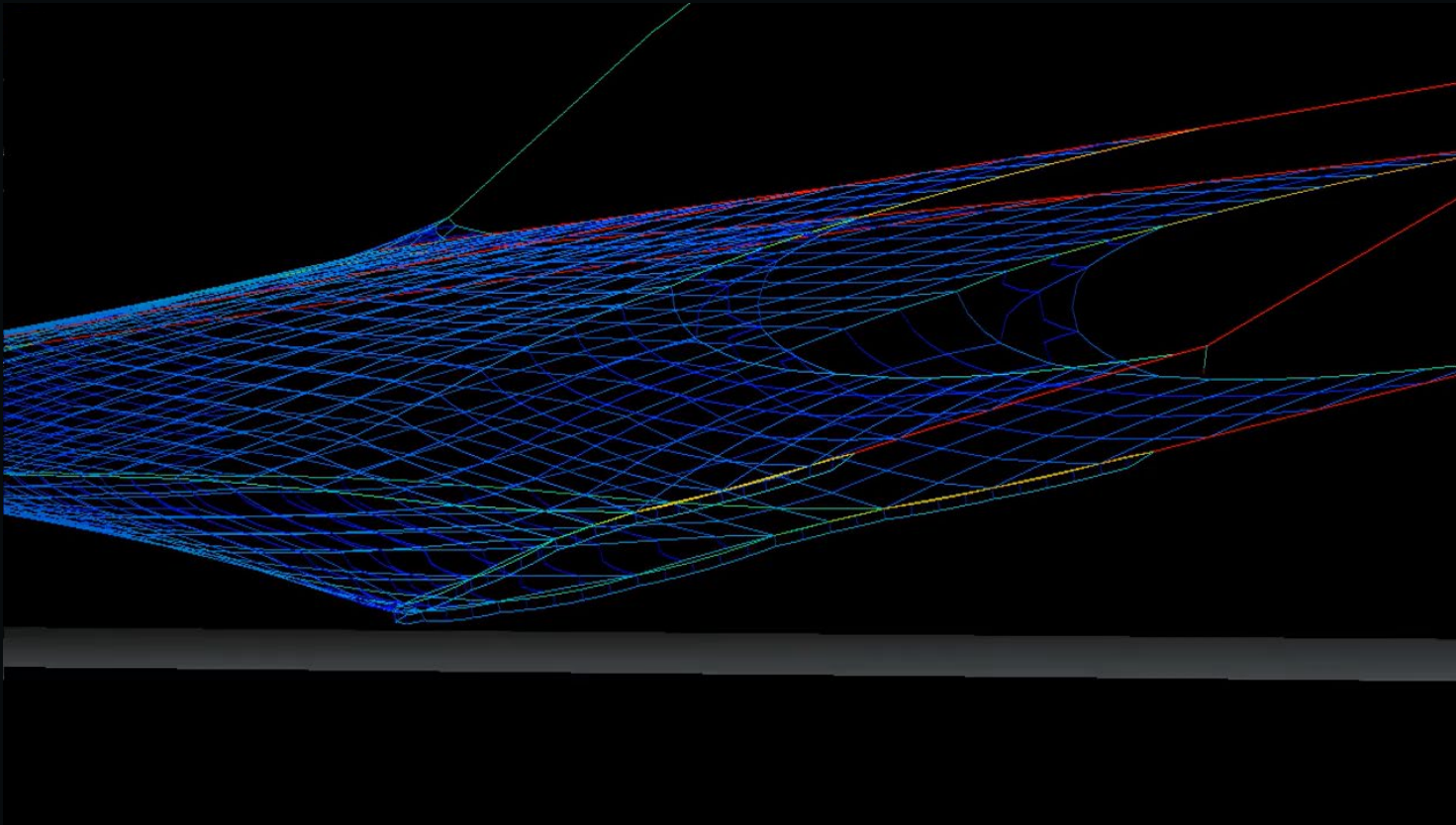


Opening (h), width (w) and contact (c)

FISHING GEAR RESEARCH

One change can alter several distinct outcomes

Understanding each pathway requires different evidence – but they have common processes



Gear position • opening • width • component contact

01 Target catch, bycatch and PSC

Encounter → capture → catch record

02 Seabed contact

Contact → habitat response + recovery

03 Unobserved encounters

Encounter → possible injury / mortality

CONTACT ≠ HABITAT EFFECT

ENCOUNTER ≠ UNOBSERVED MORTALITY

FISHING EFFECTS MODEL – STATIC GEAR TABLES

- **Fishing Effects Model** is a decision-support tool. It employs spatially-explicit Vessel Monitoring System (VMS), Observer data, **gear dimensional and contact information** and literature-based habitat impact information to:
- Quantify and visualize fishing activity.
- Estimate fishing footprint and bottom contact.
- Estimate cumulative impacts of fishing on Essential Fish Habitat.

D8 EFH Fishing Effects Discussion Paper
October 2022

APPENDIX 2 GEAR PARAMETERS

Table A2.1. The gear parameter table provides the metrics used in the Fishing Effects model for each gear type, listed by fishery. Vessel types are either catcher vessels (CVs) or catcher-processors (CPs), and the definitions for gear type and target species and other species caught and retained can be found [here](#). Contact adjustments are reported as either a range (low to high) or single metric if they were the same.

Fishery	Vessel type	Area	Gear	Target Sp.	Other Sp.	Vessel Length (ft)	Season	Depth Range (fath.)	Nominal Width (m)	Contact Adjustment
BS Pollock Pelagic Trawl	CV	BS	PTR	P	B, all others	125-151	B	≥90	115	0.2 - 0.6
BS Pollock Pelagic Trawl	CV	BS	PTR	P	B, all others	125-151	B	60-90	109	0.2 - 0.6
BS Pollock Pelagic Trawl	CV	BS	PTR	P	B, all others	125-151	B	<60	96	0.2 - 0.6
BS Pollock Pelagic Trawl	CV	BS	PTR	P	B, all others	151-300	A	≥90	132	0.2 - 0.6
BS Pollock Pelagic Trawl	CV	BS	PTR	P	B, all others	151-300	A	60-90	124	0.2 - 0.6
BS Pollock Pelagic Trawl	CV	BS	PTR	P	B, all others	151-300	A	<60	106	0.2 - 0.6
BS Pollock Pelagic Trawl	CV	BS	PTR	P	B, all others	151-300	B	≥90	163	0.2 - 0.6
BS Pollock Pelagic Trawl	CV	BS	PTR	P	B, all others	151-300	B	60-90	154	0.2 - 0.6
BS Pollock Pelagic Trawl	CV	BS	PTR	P	B, all others	151-300	B	<60	137	0.2 - 0.6
BS Pollock Pelagic Trawl	CP	BS	PTR	P	B, all others	all	A	≥90	142	0.7 - 0.9
BS Pollock Pelagic Trawl	CP	BS	PTR	P	B, all others	all	A	60-90	133	0.7 - 0.9
BS Pollock Pelagic Trawl	CP	BS	PTR	P	B, all others	all	A	<60	114	0.7 - 0.9
BS Pollock Pelagic Trawl	CP	BS	PTR	P	B, all others	all	B	≥90	175	0.8 - 1
BS Pollock Pelagic Trawl	CP	BS	PTR	P	B, all others	all	B	60-90	166	0.8 - 1
BS Pollock Pelagic Trawl	CP	BS	PTR	P	B, all others	all	B	<60	147	0.8 - 1

- GEAR INNOVATION INITIATIVE (GII) -

Purpose

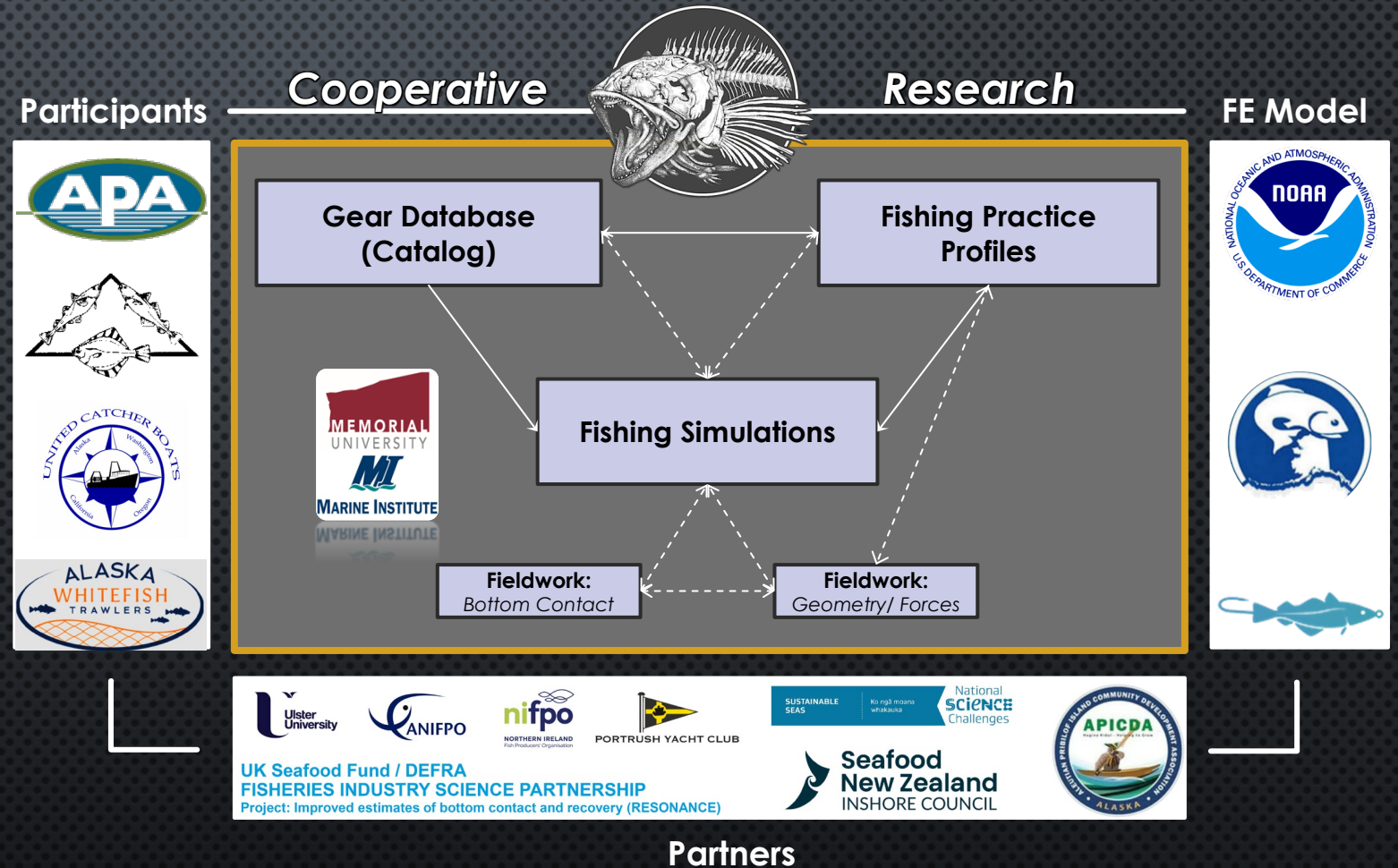
Improve Understanding of Pollock Gear and Fishery → Foundation for Innovation

- What gear is currently used in BSAI and GOA pollock fisheries?
- How is this gear implemented in pollock fishing?
- When, where and how much is this gear fished?
- When, where and how much is this gear in contact with the bottom?

Improve Fisheries Management Decision Support → Fishing Effects Model

- Gear Tables
- Fishing footprint
- Bottom contact
- Benthic habitat disturbance
- Non-habitat species interactions (e.g., crab).

Study Framework



- GEAR CATALOG / FISHING PRACTICE PROFILES-

Gear Catalog Structure:

- **Design** – Including individual net plan.
- **Materials** (e.g., footrope chain dimensions)
- **Configuration** (e.g., doors, bridle length, and set back)
- **Modification** (e.g., salmon excluders)



Fishing Practice Profile:

Set of operator-controlled parameters/ targets that influence the vertical location, and geometry of the trawl.

- Speed (k)
- Warp length (m, fa)
- Scope (ratio)
- Wing weight (kg)
- Bridle length (m, fa)
- Setback (m, fa)
- Door roll (deg)
- Headline depth (m, fa)
- Vert. opening (m, fa)
- Wing spread (m, fa)
- ...



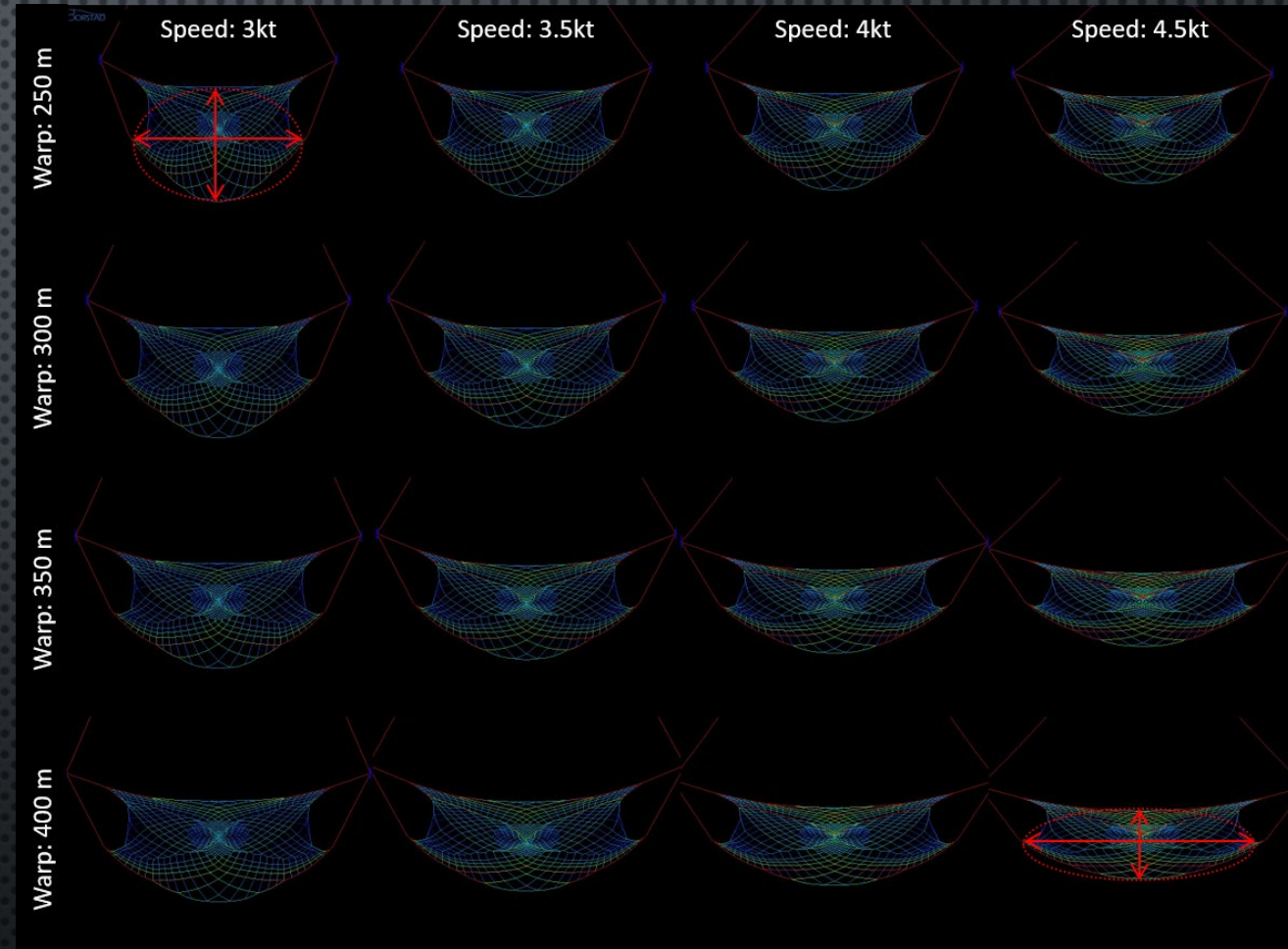
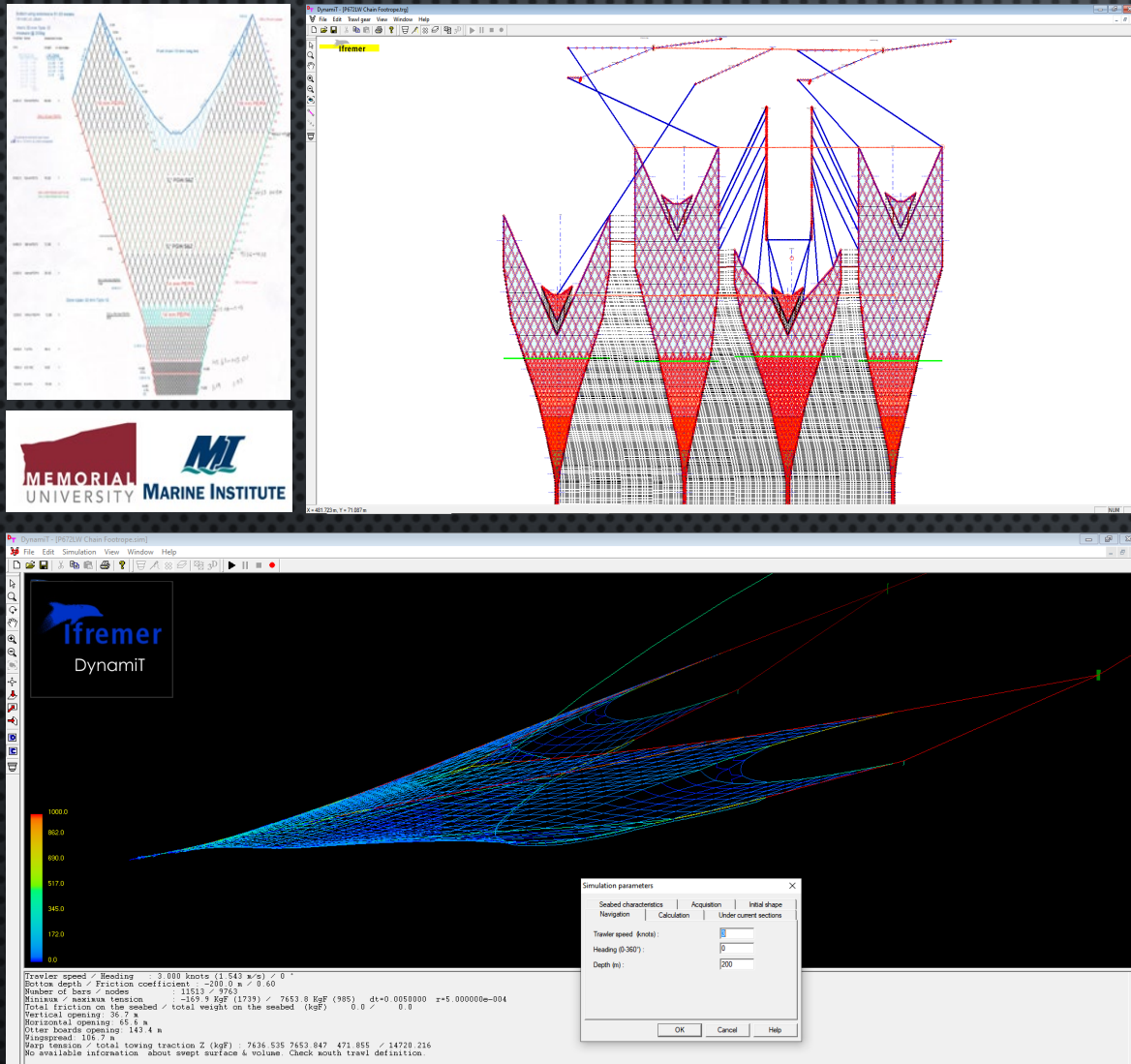
- Catalog Structure Guidance



- Information Quality Control

NET PLANS → GEAR SIMULATIONS

Gear Plan + Cataloged Specifications + Fishing Scenarios

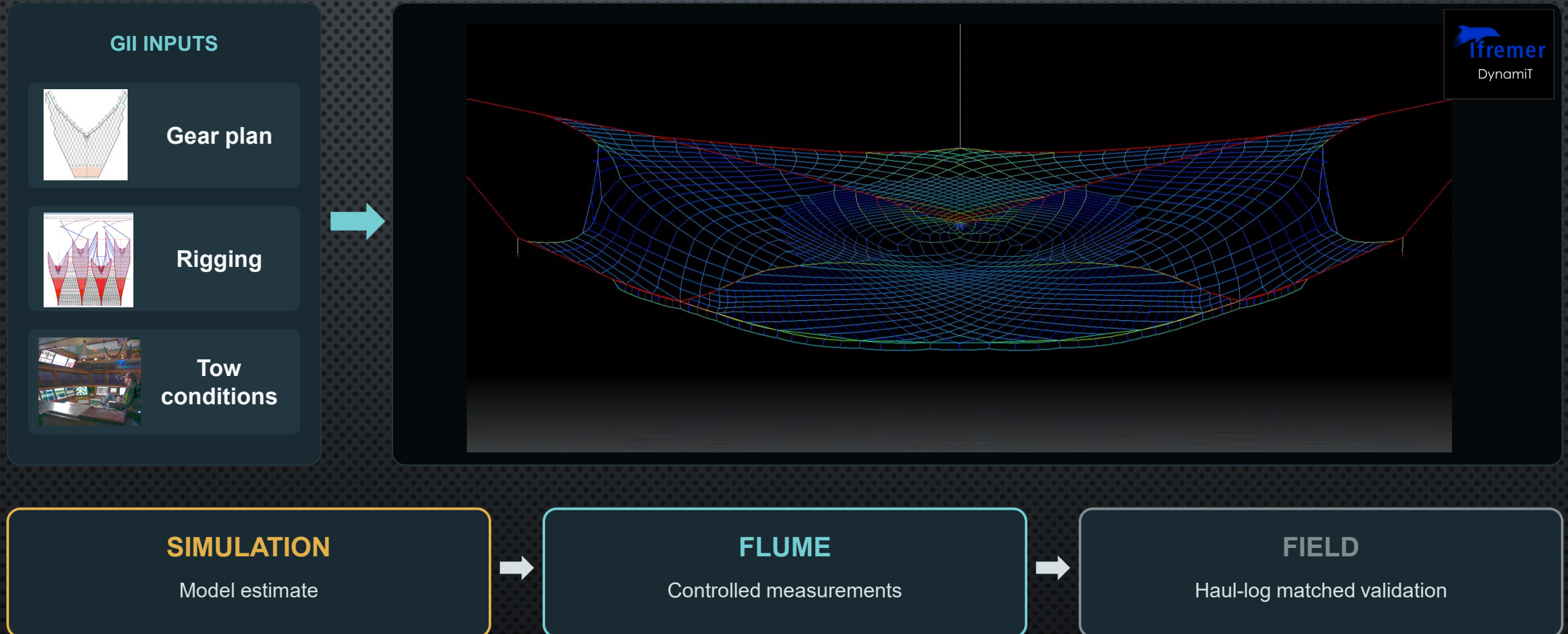


Simulations generate expected geometry and forces under realistic rigging and fishing practice iterations

NET PLANS → FISHING SIMULATIONS

Simulating geometry from real fishing scenarios.

Finite element model prediction allows controlled repeatable gear comparison.



FIELD SAMPLING: TRAWL GEOMETRY

- Gear specifications and haul-level fishing practice data
- **Realized** trawl geometry and forces (net mensuration sensors).
- Construct matching simulation
- **Compare simulated and realized trawl geometry and forces**



EXAMPLE

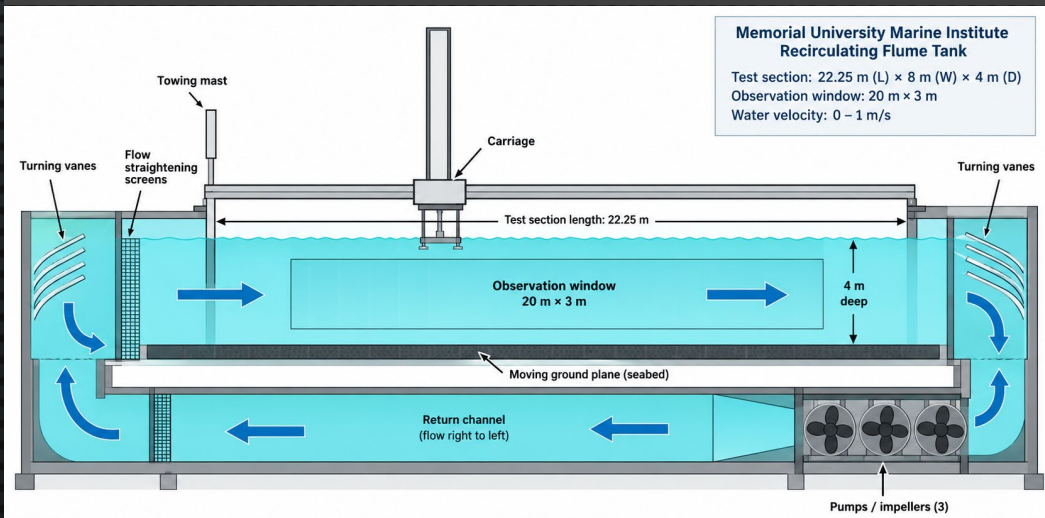
Vessel Name		
A Season		
Trawl in use: ☐ Swan 1056 ☐ Egersund 1512 ☒ Swan 1280 ☐ Other: _____		
Doors in use: ☒ Thyboron type 22 VK ☐ Other: _____		
Rigging:		
Bridle length: <u>35</u> fathoms/meters/feet		
Setback length: <u>15</u> fathoms/meters/feet		
Wing Weights per side: <u>2000</u> lbs/kg		
Haul Information:		
Haul Number: (Match to logbook #) <u>120</u>		Date: <u>03/04/25</u>
Start of haul	Start time: <u>1230</u>	Start Lat/Lon (dd.dddd): <u>54.4300 N 167.0977 W</u>
	Bottom Depth: <u>48 fathoms</u>	Vessel Speed: <u>3.5 knots</u> Main wire payout: <u>90 fathoms</u>
	Headrope Height: <u>38 fathoms</u>	Door Spread: <u>95 fathoms</u>
	Vertical Opening: <u>10 fathoms</u>	Fishing circle width IF AVAILABLE: <u>75 fathoms</u>
	Seastate: <u>5 (on Beaufort Scale)</u>	Notes:
	Tension on winches IF AVAILABLE: <u>10100 kgf</u>	<u>towing into/with/cross current</u>
In tow entry	Time of entry: <u>1300</u>	
	Bottom Depth: <u>50 fathoms</u>	Vessel Speed: <u>3.4 knots</u> Main wire payout: <u>93 fathoms</u>
	Headrope Height: <u>39 fathoms</u>	Door Spread: <u>93 fathoms</u>
	Vertical Opening: <u>11 fathoms</u>	Fishing circle width IF AVAILABLE: <u>73 fathoms</u>
	Seastate: <u>4</u>	Notes:
	Tension on winches IF AVAILABLE: <u>10120 kgf</u>	

VALIDATING THE SIMULATIONS

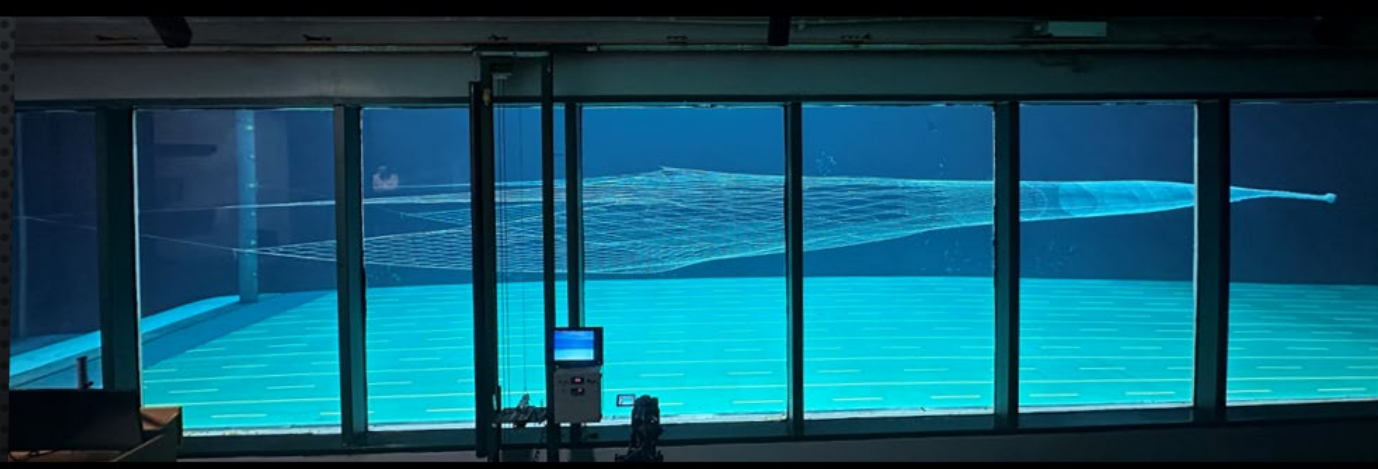
Flume Tank Testing

Controlled experimental gear trials

- 1.7-million-liter (450k gallon) recirculating tank
- 8m × 4m test section
- 22m long observation chamber
- Flow speeds up to 1 m/s
- Moving seabed simulation system
- Underwater force measurement
- Controlled trawl-geometry experimentation
- Real-time underwater gear observation



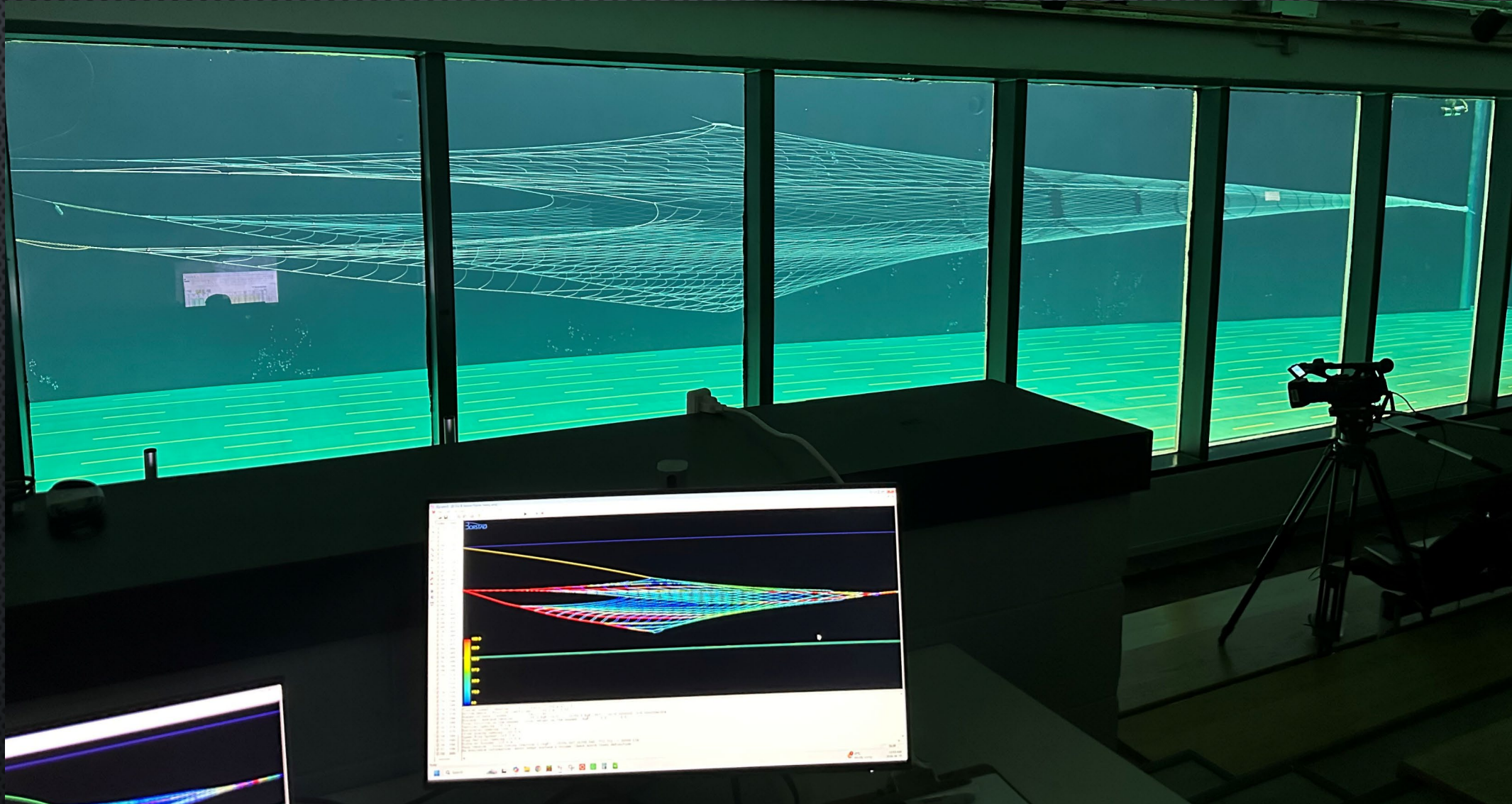
A flume is an engineered channel of flowing water used to study how water interacts with objects.



VALIDATING THE SIMULATIONS

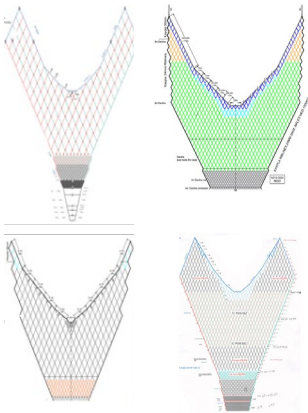
Flume Tank: Testing geometry and contact predictions

3 CP trawls, 4 rigging configurations, 5 door spreads, 10 speed settings, 153 tests



291

Trawls cataloged



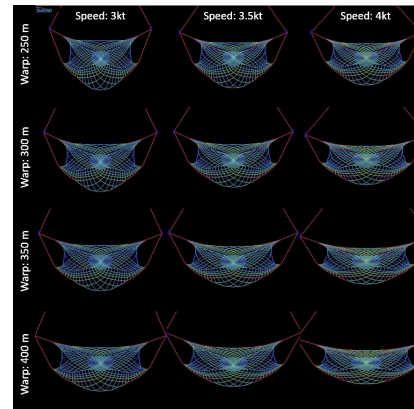
105

Fishing Practice Profiles



115

Fishing simulations



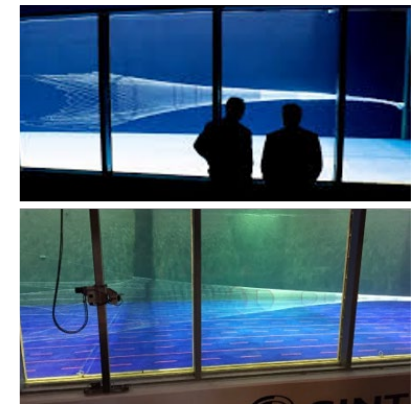
252

Haul logs collected

Vessel:	
☐ A Season ☐ B Season	
Trawl in use:	
Doors in use:	
Hauling:	
Bridle length: meters/meters/feet	
Bottom length: meters/meters/feet	
Wing weights per side: Bar(s)	
Haul Information:	
Haul Number:	Date:
Start time:	Start Location (lat/long):
Bottom Depth:	Vessel Speed:
Headrope Height:	Door Spread:
Seacatch:	Fishing circle width IF AVAILABLE :
Notes:	
Tension on main winches IF AVAILABLE :	
Tension on third wire IF AVAILABLE :	
Time of entry:	
Bottom Depth:	Vessel Speed:
Headrope Height:	Door Spread:
Vertical Opening:	Fishing circle width IF AVAILABLE :
Seacatch:	Notes:
Tension on main winches IF AVAILABLE :	
Tension on third wire IF AVAILABLE :	

3

**CP scale models
for tank validation**



Gear catalog

What is fished



FPPs

How it is fished



Simulations

How gear behaves



Haul logs

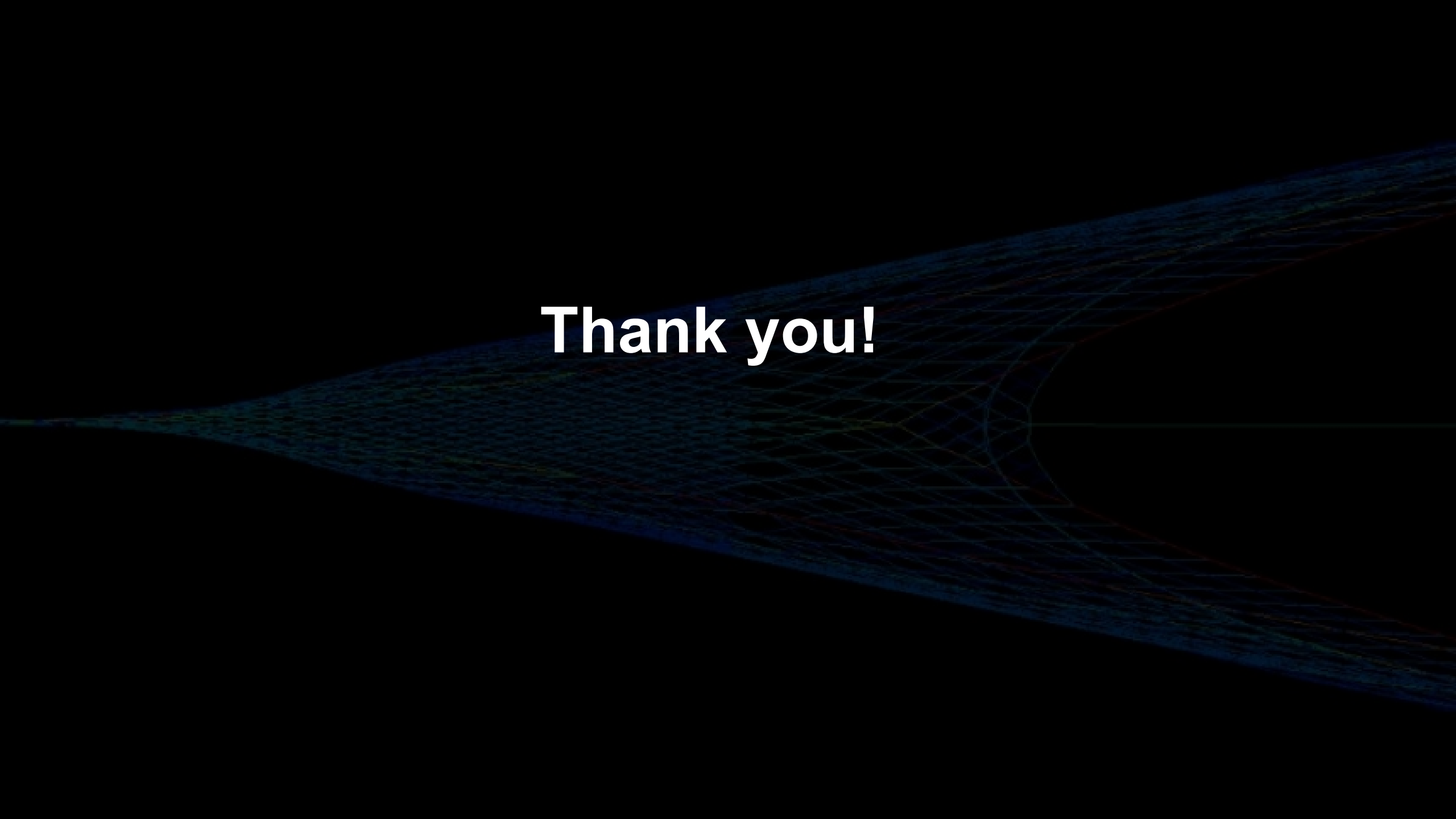
How it looked in
practice



Tank / sensors

How we validate
contact

We are moving from "what generic pelagic trawls might do" to "what documented gears do under documented fishing scenarios."

The background features a complex, abstract pattern of thin, glowing blue lines that form a grid-like structure. This grid is not perfectly rectangular, with some lines curving and intersecting in a way that suggests a warped or dynamic space. The lines are most concentrated in the lower half of the image, creating a sense of depth and movement. The overall effect is reminiscent of a digital or scientific visualization, such as a mesh or a data field.

Thank you!