Investigating Vulnerable Marine Ecosystems (VMEs) from Korean distant-water fisheries

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Vulnerable Marine Ecosystem (VME)

- Vulnerable = exposed, easily disturbed, and slow to recover

- The definition of VME should incorporate the spatial extent of the disturbance process (e.g. fishing effort) and the expected ability of the ecosystem to recover, implying that the results of a completed impact assessment are a necessary prerequisite for defining a VME

- Criteria for identifying VMEs include uniqueness or rarity of species or habitats, their functional significance, fragility, and structural complexity as well as life histories that limit the probability of recovery

Information necessary to assess whether bottom fishing activities would have significant adverse impacts (SAIs) on vulnerable marine ecosystems (VMEs) including seamounts, hydrothermal vents and cold water corals

Significant Adverse Impacts = Degrades long term ecosystem productivity, impairs (>20 years) recovery of biodiversity or habitat

- The spatial expanse of the impact
- The sensitivity of the ecosystem to impact
- Magnitude of allowable change of ecosystem function
- Magnitude of allowable decline in habitat and biodiversity and loss of indicator species
- The duration of time required for recovery
- The level of uncertainty associated with the above information needs

Information needs to survey seamounts for refugia

- Observer-based Monitoring of Trawl Catch
- Location Records of Trawl Hang-ups
- Multibeam and Side-Scan Sonar Surveys
- ROV, Drop-Camera, Submersible Surveys

Background

- Due to the shortage of data and information to define Vulnerable Marine Ecosystem Encounter, scientific observer aboard fishing vessel collect them in the North Pacific High Sea

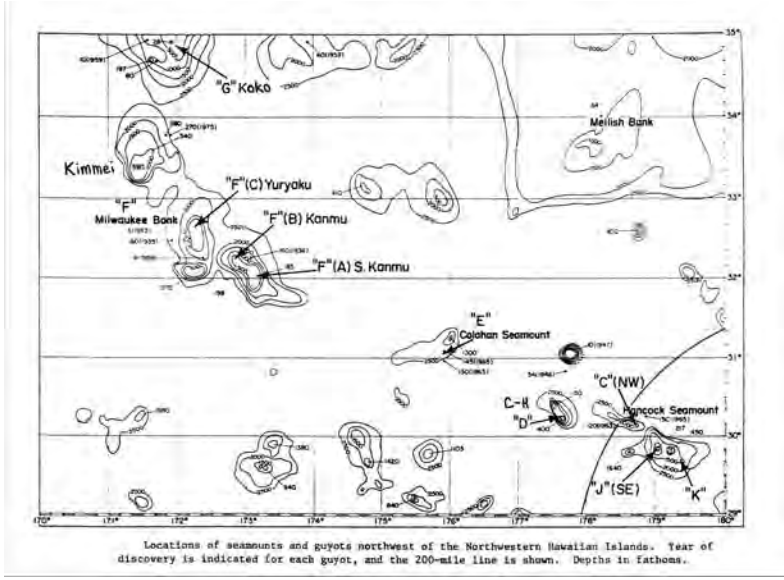
- Major target fish species, such as alfonsin and amorhead, expect to be decided as management species for bottom trawl fishery around seamount in FAO 61 area, after North-western Pacific Bottom Fisheries Management Organization be established

Purpose

- From deployment by international onboard observer to the distant-water fisheries in the North Pacific Ocean, data and information on all by-catch species and total quantity of VME-indicator organisms, such as corals, sponges and benthos, will be contributed to develop the process to estimate the cumulative impact of fishing activity on individual vulnerable taxa in the deep-sea region.

- At each step VMEs are displayed in tabular form and combined to derive an estimate of total cumulative impact by bottom fisheries.

Summary of Korean bottom trawl fisheries in North Pacific

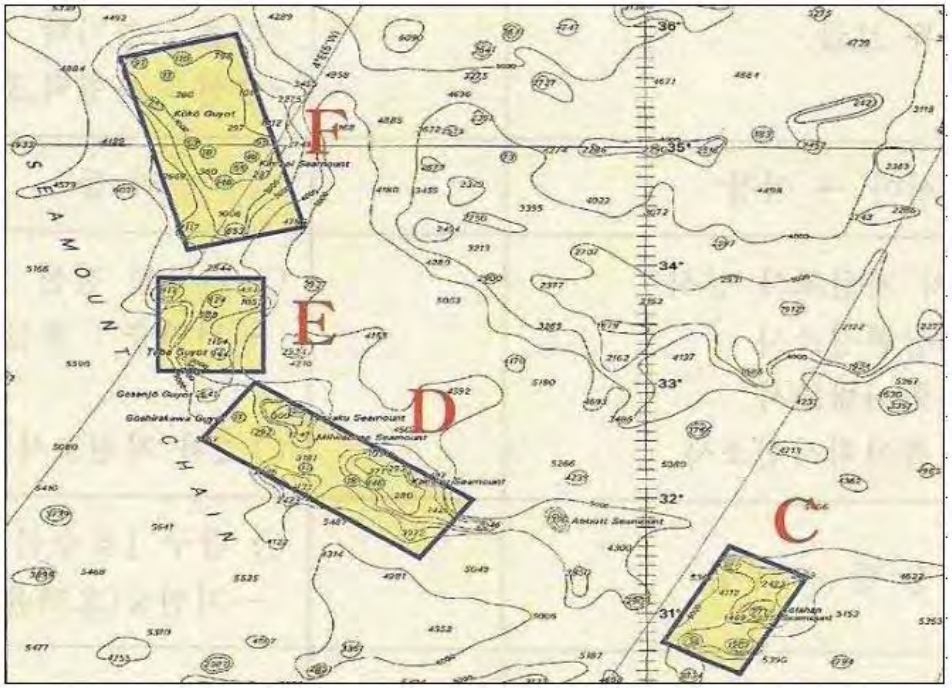


Locations of seamounts and guyots northwest of the Northwestern Hawaiian Islands. Year of discovery is indicated for each guyot, and the 200-mile line is shown. Depths in fathoms.

Year	Trawl (no. of vessel)	Fishing day	Catch(kg)		Fishing ground
			N. Pacific Armorhead	Spkendid Alfonsin	
2001	0	0	0	0	-
2002	0	0	0	0	-
2003	0	0	0	0	-
2004	2	90	185	16	Jingu; Ojin; Koko; Milwaukee; Colahan; C-H
2005	1	146	141	513	Koko; Kinmei; Milwaukee; Colahan
2006	2	99	139	289	Koko; Kinmei; Milwaukee; Colahan
2007	1	164	89	325	Koko; Kinmei; Milwaukee; Colahan
2008	2	256	892	121	Koko; Milwaukee; Colahan
2009	**2**	**164**	**100**	**31**	Koko; Milwaukee; Colahan

2010 onboard survey

- Period: Feb. 25. – Jun. 23. 2010
- Area: Midway, North Pacific



- C Area : 31°03N/175°53E ~ 31°03N/175°55E
  31°00N/175°52E ~ 31°00N/175°52E
- D Area : 32°20N/172°42E ~ 32°20N/172°55E
  31°55N/173°07E ~ 31°55N/173°13E
- E Area : 32°43N/172°16E ~ 32°43N/172°19E
  32°40N/172°16E ~ 32°40N/172°19E
- F Area : 35°45N/171°00E ~ 35°45N/172°00E
  34°52N/171°45E ~ 34°52N/172°00E

Vessel

- Name : # 96 Oyang
- Radio signal : DTBP6
- Gross/ Net tonnage/ Power : 360 ton /393 ton / 2900 HP
- Length (LOA): 60.53M / Width: 11M / Depth: 6.65M
- Volume : 687.66㎥
- Fish Bond : 46.23㎥
- Crew : Captain Yang-Woo Lee and 40 crews (Korean 10, Indonesian 18 , Philippine 12)

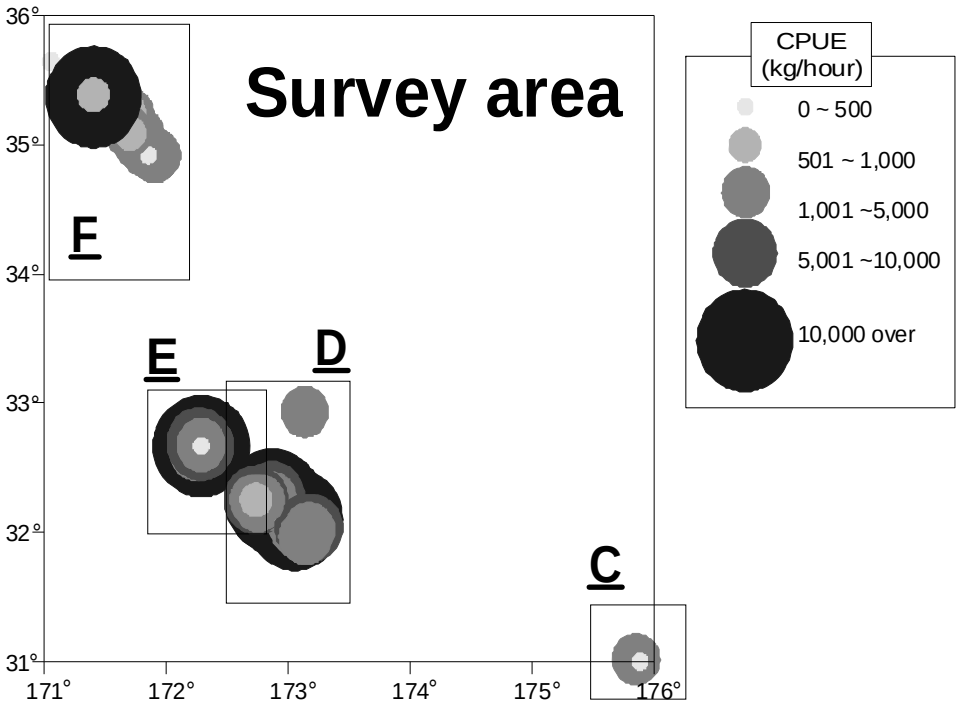
Fishing gear

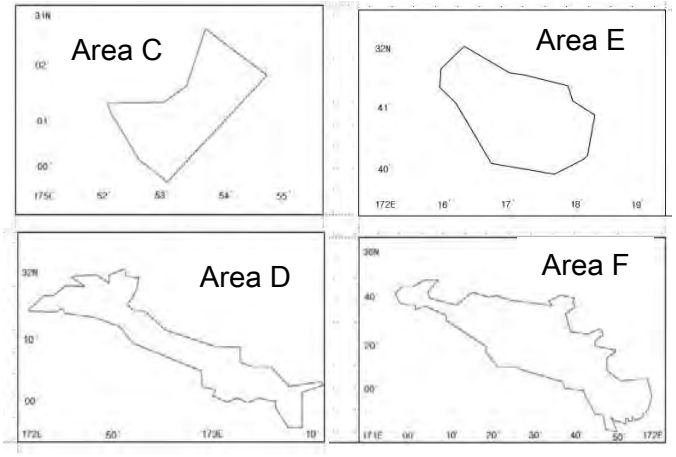
- Bottom trawl

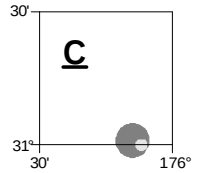
Part	Size	Part	Size
Net length	90.2m	Otter board weight (in air)	7100kg
Net body	77.37m	Otter board weight (in water)	6177kg
Net circumference	29.02m	Otter board size	3000 x 4700mm
Codend	20.3m	Chain weight (in water)	m/7.77kg
Net height (max/min)	11m/6m	Main warf	36mm
Net width (max/min)	240mm/120mm	Headrope	36.5m

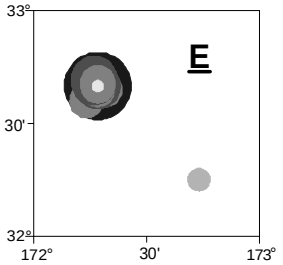
Spatial pattern

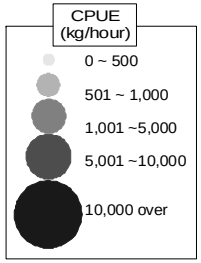
CPUE (kg/hour) by area

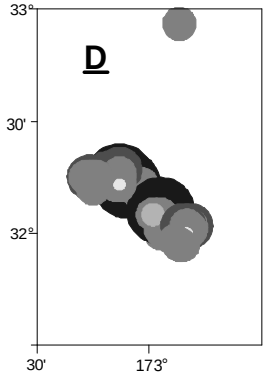


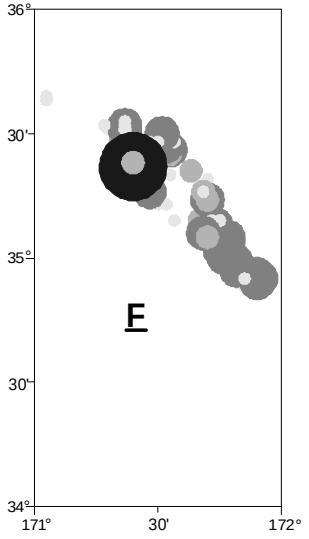






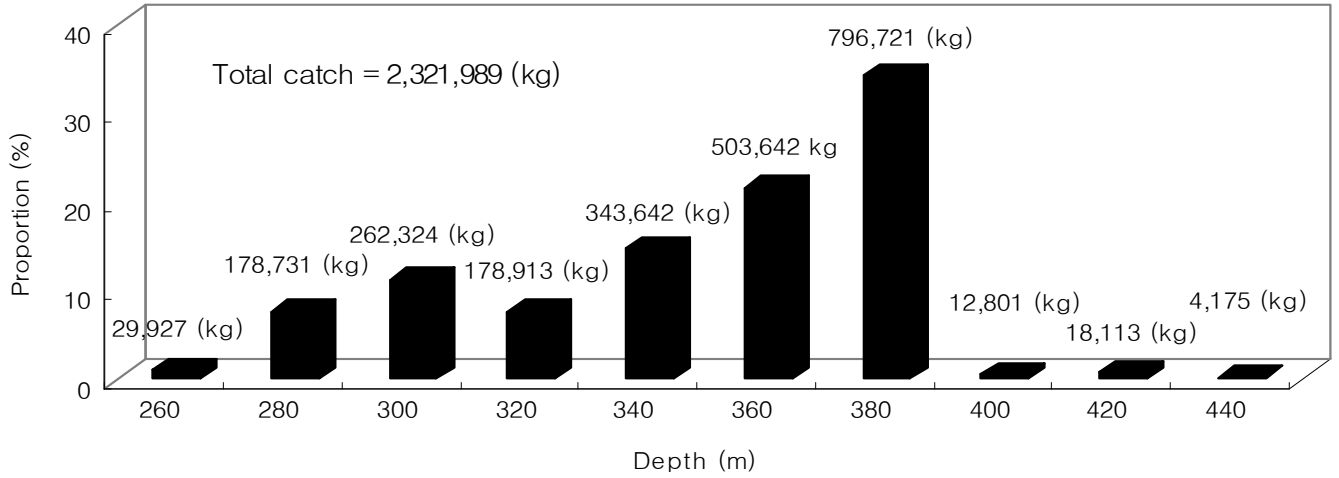




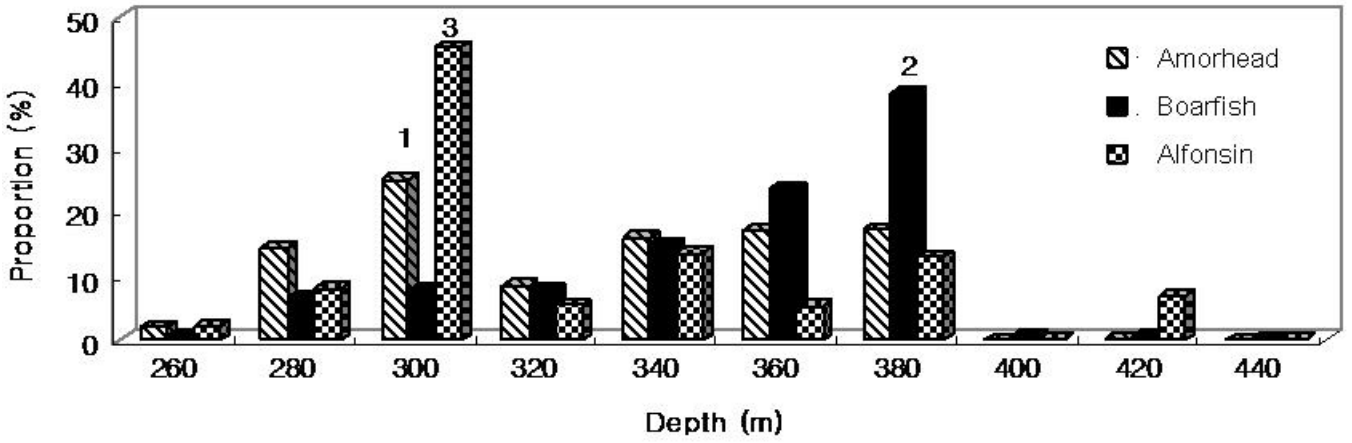


Catch by depth (m)

Total catch by depth



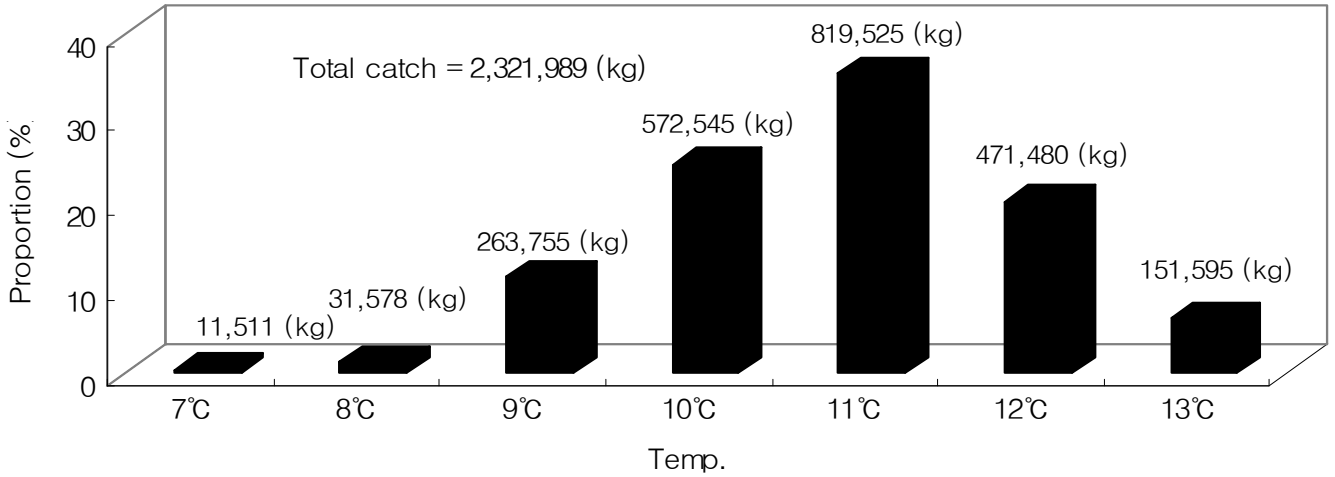
Catch of target species by depth



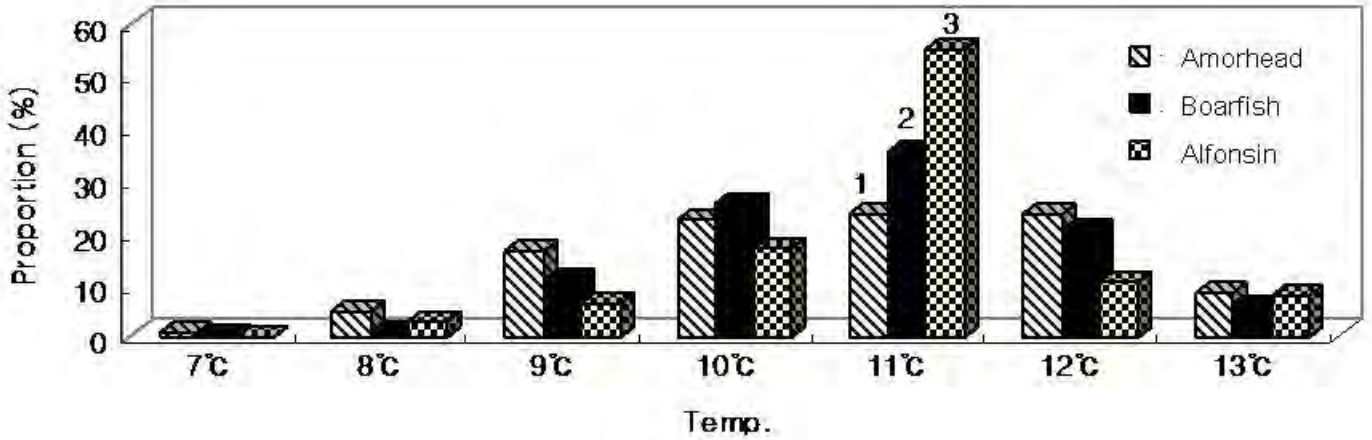
Catch by temp.(℃)

- *Unusually this year, catch was higher and seawater temperature was lower during fishing operation*

Total catch by temp.



Catch of target species by temp.

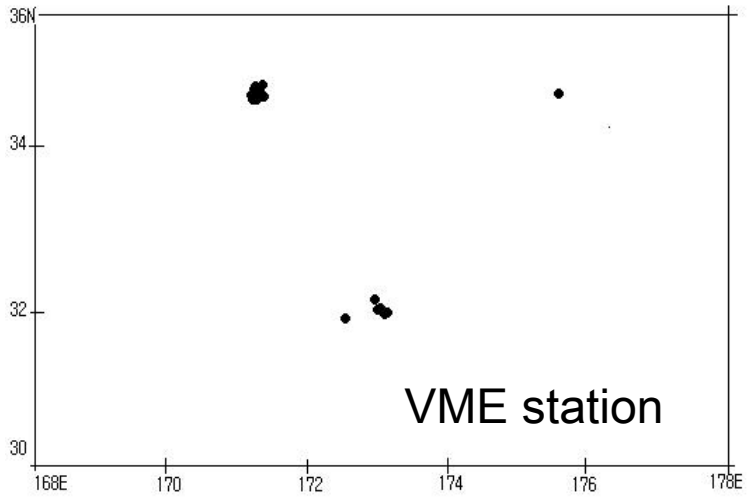


Vulnerable Marine Ecosystem (VME)

GGW (Chrysogorgiidae)		AQZ (Black corals)	
GOC (Bamboo)		SBA (Basket stars)	
GGW (Cnidaria sp2)		CSS (Madrepora culata)	

VME position and weight

- Coral was found from 224 hauls in total, but small amount



Haul #	Mid point (S. E)		GOC	GGW	AQZ	CSS	AQZ	SBA
			kg	kg	kg	kg	kg	kg
6	72°42‘	176°29‘		1				
6	72°35‘	176°16‘			0			
15	76°36‘	176°13‘		0.04				
15	71°43‘	177°37‘			0			
18	71°59‘	173°1‘	0.1					
20	71°58‘	173°18‘				0.04		
33	75°45‘	170°53‘				0.06		
70	75°56‘	170°31‘					0	
73	76°44‘	170°35‘					0.02	
81	76°46‘	170°38‘		0.1				
81	76°56‘	171°48‘		0				
120	77°00‘	172°24‘		0.02				
194	76°55‘	172°25‘		0				
198								500


Classification guide for VME
- CCAMLR guide (2009)
- New Zealand SPRFMO guide (2008)
- Australia guide for scientific observers aboard fishing vessels (2009)

Summary and Discussion

- Unusual high catch was recorded in 2010 since Korean trawl fishery began after 2004 in the North Pacific high seas
- In 2010 higher catch maybe related to lower seawater temperature during fishing operation
- Diverse coral branch was found from every haul, but a little. The small amount of VME, esp. coral in the NP high sea, could be caused by accumulated fishing activities for long-term bottom trawl fishery.
- Prior to assessment of SAIs on VMEs, Additional Interim Measures

✓ Fishing on Large Seamounts only in Restricted Areas
✓ Modify Trawl Gear to Fish Off-Bottom
✓ Close Fishing on Small & Peaked Seamounts
✓ These Measures also Promote Sustainable Fishery Management


Thank you
for your attention