

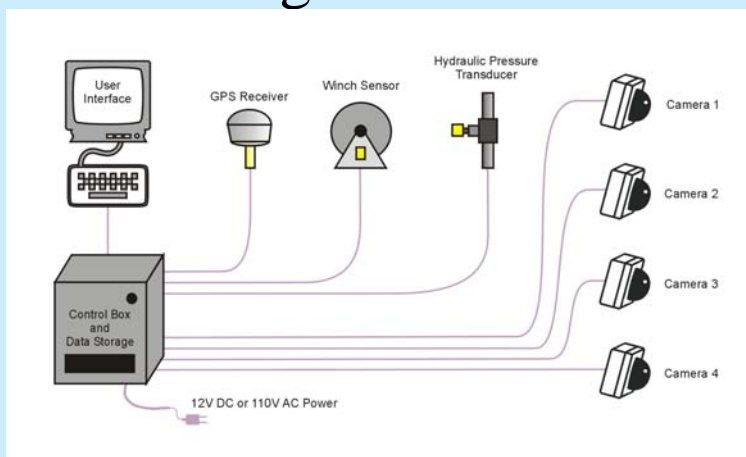


At-Sea Observing Using Video-Based Electronic Monitoring

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Archipelago Marine Research Ltd.



What Is Electronic Monitoring?

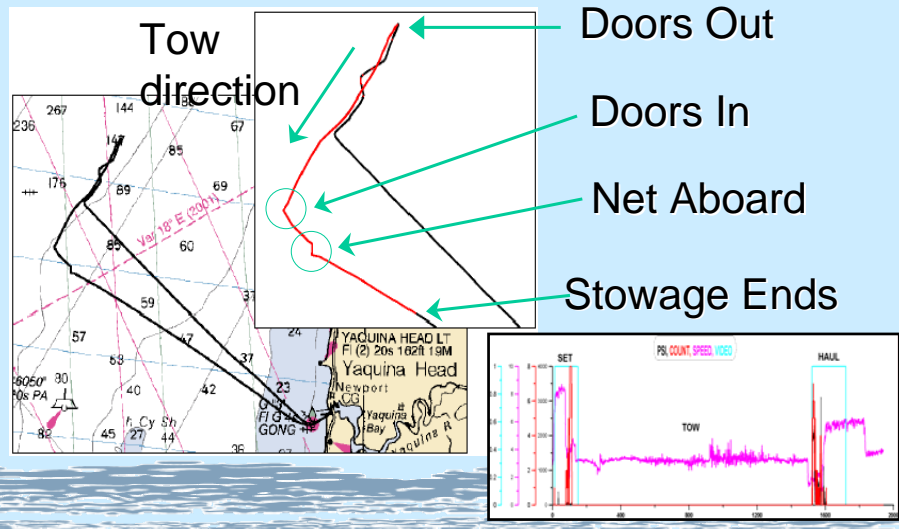




Control Box

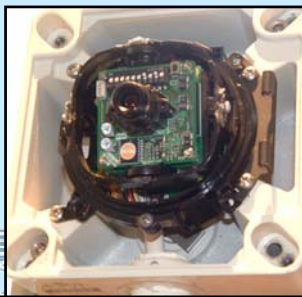


EM Sensor Data Spatial Plot





CCTV Cameras



CCTV Imagery





Trawl Fishing Imagery



Camera Views – NZ Set Net





Camera Views – Taz Red Bait



Camera Views – Alaska Trawl





Camera Views – California Drift Gillnet



Camera Views – Pelagic Longline





Camera Views – Pelagic Longline



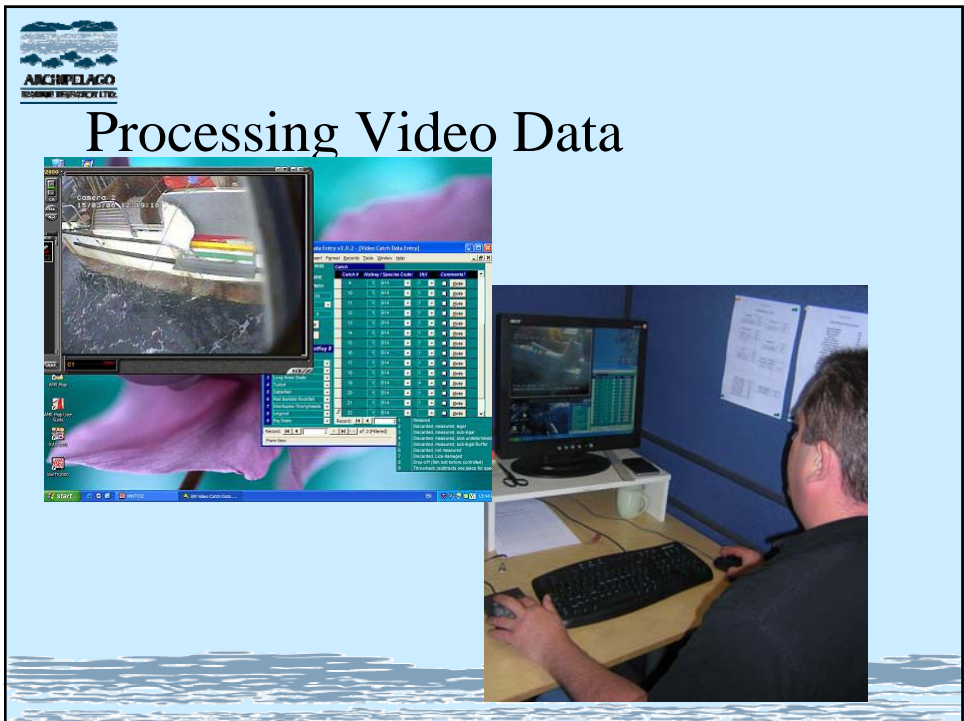
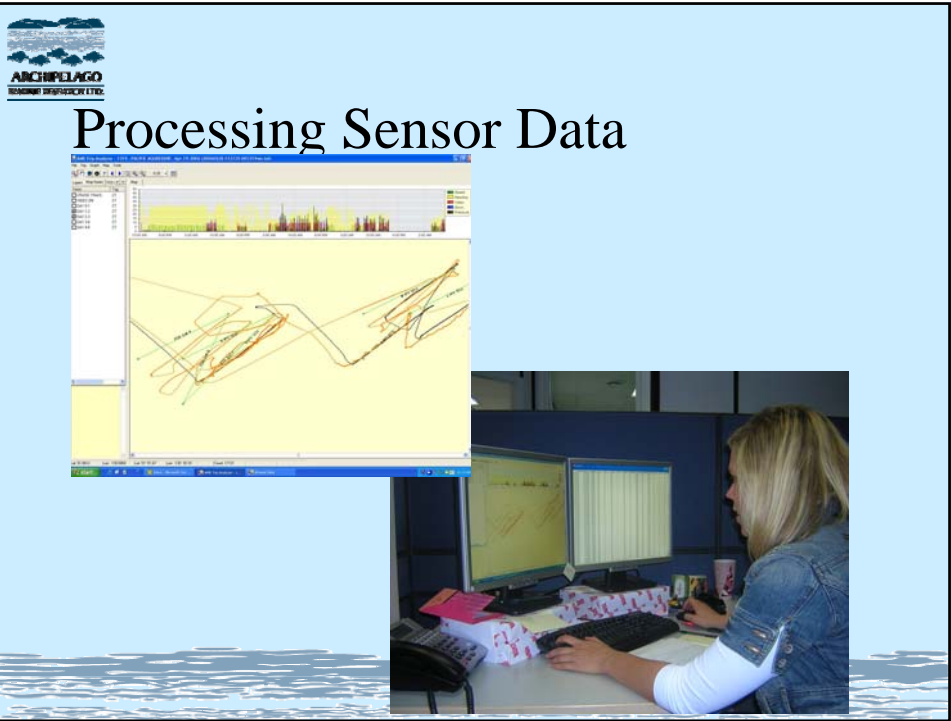
CCTV Image Quality



Poor

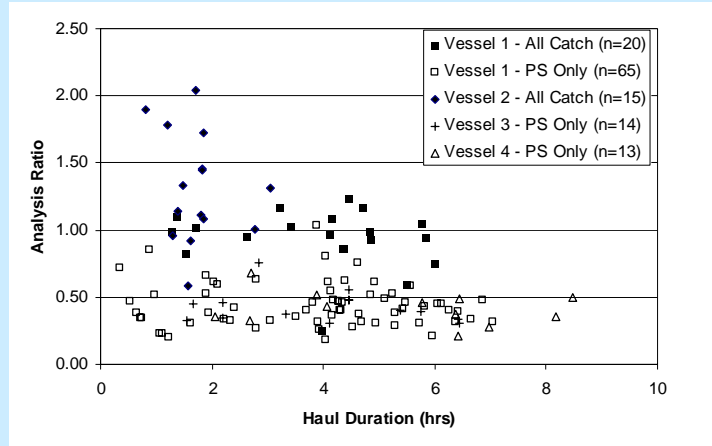
Medium

Good





Analysis Ratios



Case 1: BC Area A Crab Fishery

- Target: Dungeness crab
- North coast of BC
- Scope:
 - ~50 fishing vessels
 - ~3,000 fishing days
 - ~30,000 traps
- Entirely single-buoyed trap gear
- Value ~\$10 million





Fishery Issues . . .

- Vessel-based trap limits
- Vandalism
- Gear loss
- Catch & gear theft



The Solution . . .

- Area A Association leadership
- 100% electronic monitoring
- User pay

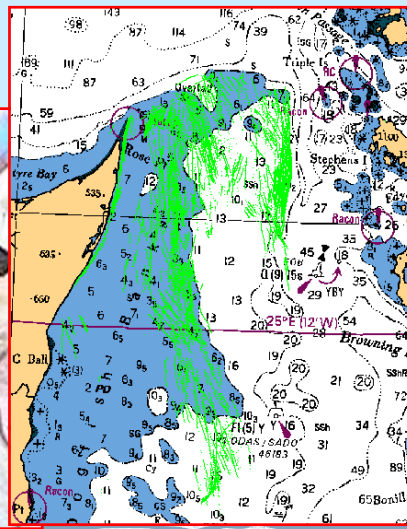


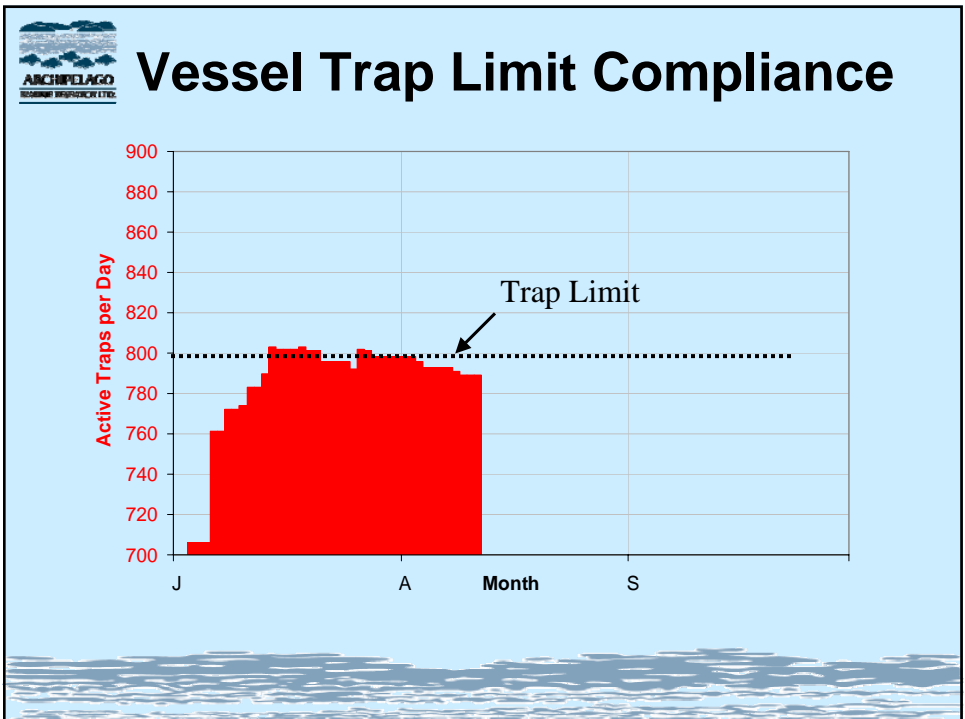
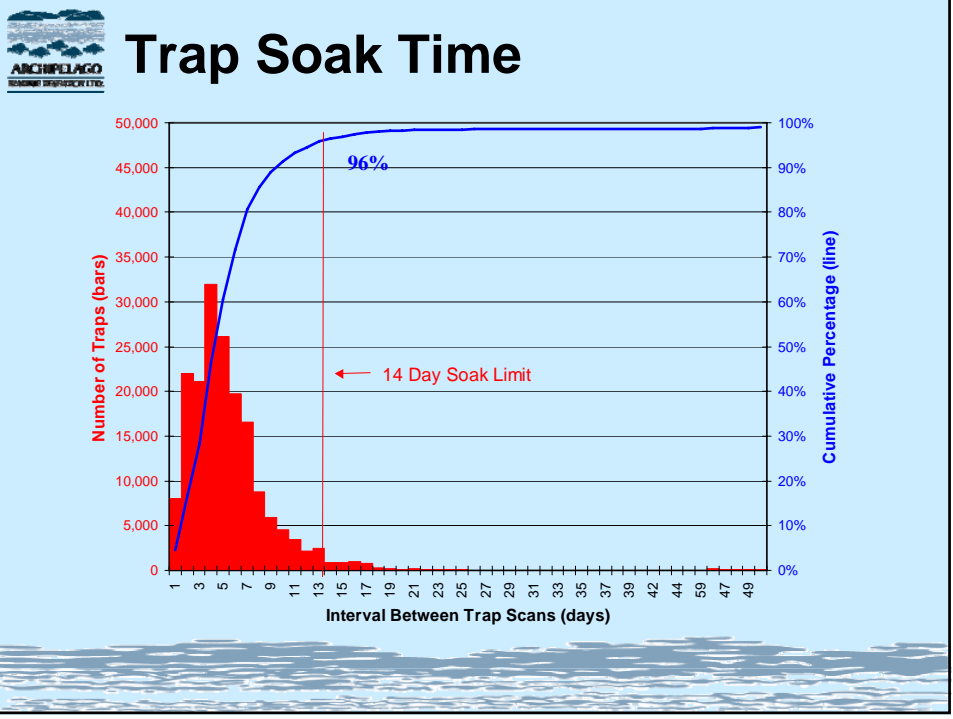


Camera Imagery



Managing Trap Inventories with RFID Technology





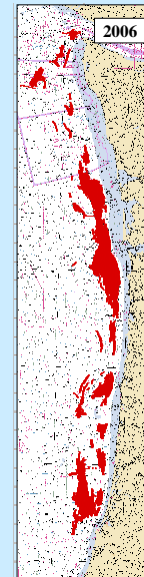


Outcomes of Crab Monitoring Program

- 100% monitoring of entire fishery
- Encouraged compliance by ‘leveling the playing field’
- Addressed monitoring requirements
- Saved fishermen money.



Case 2: WOC Shore Side Hake Fishery





Monitoring Objectives

- Confirm maximized retention of catch
- Confirm fishing occurs within permissible areas
- Better characterize the fishery
- Independent verification
- Cost-effective



Example of Net Discard

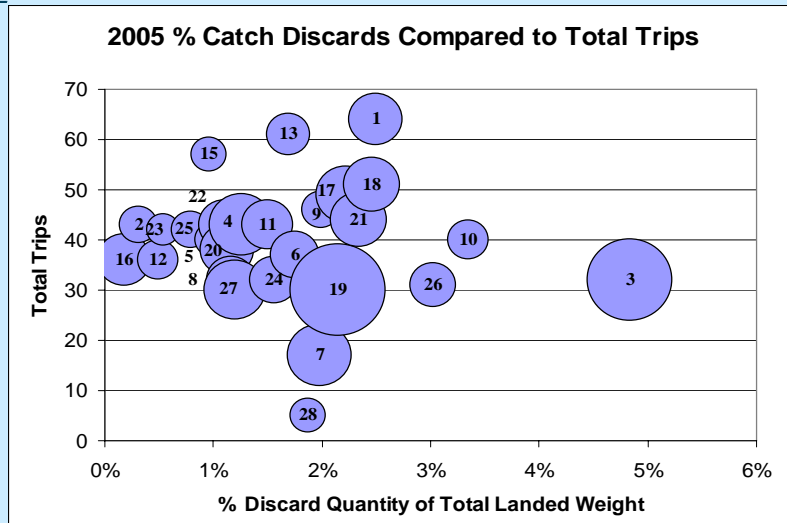




Example of Deck Discard

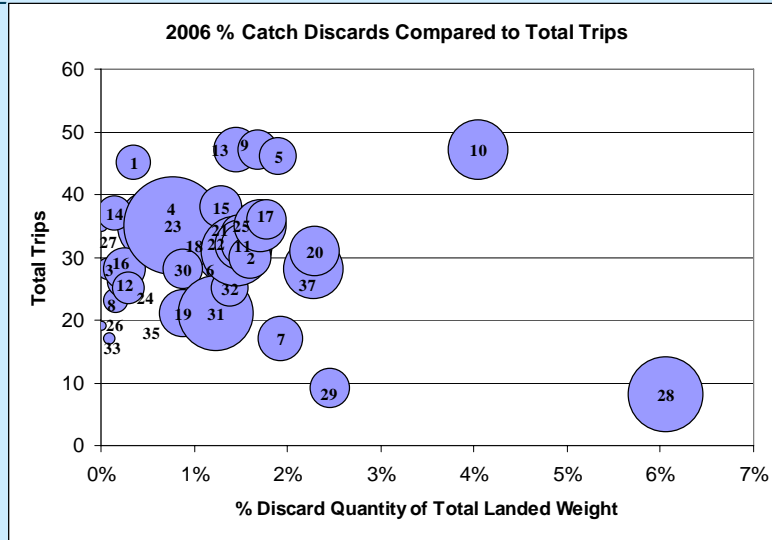


2005 Discard Fraction (%)

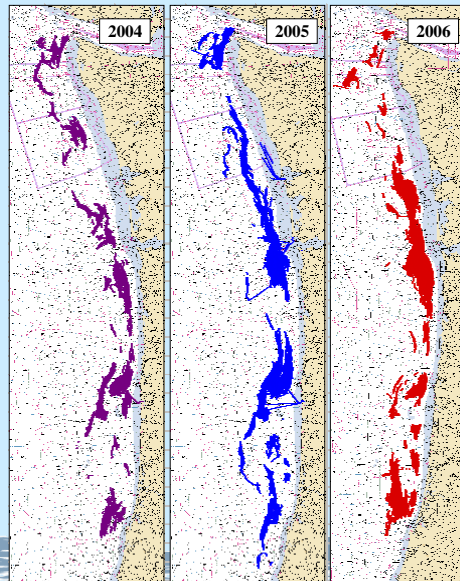




2006 Discard Fraction (%)



Annual Fishery Variation





Outcomes of Shore Side Hake Program

- Monitoring has improved management of the fishery
- Monitoring has changed fishery
 - Reduced discards
 - Improved fishery data
 - Higher industry involvement



Case #3: BC Groundfish Hook and Line Fishery

<u>Species</u>	<u>Licence Category – Target Species</u>
Rockfishes (39+ spp)	L - Halibut
Sablefish	K - Sablefish
Spiny dogfish	Schedule II - Dogfish
Lingcod	Schedule II - Lingcod
Pacific halibut	Outside Zn- Rockfish
	Inside Zn- Rockfish





Monitoring Objectives

- Individual accountability
- 100% catch accounting- including releases



Audit-Based Monitoring



Dockside Monitoring

+

Fishing Log



Official Trip Record

Electronic Monitoring





Fishing Log Example

Set		Pieces	
		Kept	Released
1	Rockfish	45	1
	Halibut	65	6
	Sablefish	0	14
2	Rockfish	50	0
	Halibut	62	27
	Sablefish	0	50
3	Rockfish	54	3
	Halibut	102	56
	Sablefish	0	10
...20	Rockfish	22	1
	Halibut	32	6
	Sablefish	0	10



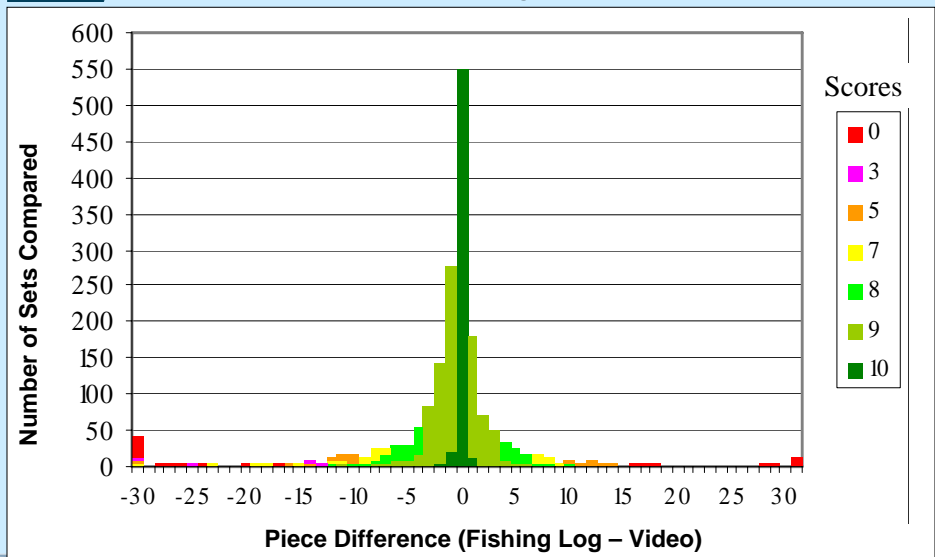
Fishing Log to Video Comparisons

Set 2	Kept		Released	
	Flog	Video	Flog	Video
Rockfish	50	49	0	0
Halibut	62	62	27	27
Sablefish	0	0	50	64

Set 19	Kept		Released	
	Flog	Video	Flog	Video
Rockfish	20	20	0	0
Halibut	0	0	34	35
Sablefish	0	0	15	50



Score Reliability (rockfish)



Audit Consequences

- ▶ Delayed fishing for investigation
- ▶ Additional cost for investigation
- ▶ 100% review of video, paid by fisherman
- ▶ Mandatory observer (no EM)



Monitoring Program Outcomes

- 100% Catch accounting using fisher's data
- High Industry involvement and accountability
- Improved Fishing Log accuracy (over time)
- Fishery monitored at 30% the cost of at sea observers



EM Strengths

- Lower cost than at-sea observing
- Suitable for small boats
- More easily scalable
- 24/7 monitoring
- Provides an engagement tool
- Permanent data record
- De-links data collection and analysis



EM Weaknesses

- Limited biological sampling
- Not adaptive for complex sampling processes
- Weak liaison/communication tool
- Untested as court evidence
- Requires industry engagement



EM Program Considerations

- Organizational structure is important
- Program must address privacy concerns
- EM Programs require industry engagement



Conclusions

- EM technology is well developed and suited to vast array of fishery monitoring issues.
- Future at-sea monitoring will involve EM, observers or both.
- Organizational structure and industry engagement are critical for EM success
- Balancing privacy concerns and data outputs form an EM program is critical.
- EM can be very cost effective.



For Further Information:

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