

## Types of EM tools, and what can be achieved with them

EM Data requirements for discard estimation								
Tools	Species ID	Species Count	Weight Conversion	Percent Retained	Fishing Event	Set Date and Time	Set Location	Measure of Fishing Effort
<b>VMS</b>								
<b>Logbook</b>								
Paper				?	X	X	X	X
E-log				?	X	X	X	X
Integrated E-log-Sensor								
<b>Sensors <sup>1/</sup></b>								
Drum Rotation					X			
Hydraulic Pressure					X			
GPS						X	X	
RFID					X			
Proximity					X			
Sensor Data Model					X	X	X	
<b>Video/Images <sup>1/</sup></b>								
Rail <sup>2/</sup>	X	X		X	X			X
Combined with Measurement Board				X				
Bin (for Volume)				X				
Graded Chute				X				
Stereo Rail <sup>3/</sup>	X	X	X	X	X			X
Chute	X	X	X	X	X			

<sup>1/</sup>May be tamper evident but not tamper proof

<sup>2/</sup>Image quality *highly influenced by environmental factors and maintenance*

<sup>3/</sup>Self cleaning lens improves data quality

### Identification of key challenges for estimation

- Incomplete monitoring of an entire trip
- Weight estimation and expansion
  - Independent data collection as opposed to self reported or "borrowing"
- Validation to support rigorous data collection
  - Identification of data quality issues due to tampering
- Data collected such that each combination of species, gear type, disposal (retained/Discarded), weight for each haul is maintained
- Changes to catch handling procedures
- Integration into vessel operations

Tools	Data Validation Using	Pros	Cons
<b>VMS</b>		Implemented in many fisheries	Low data rate
<b>Logbook</b>			
<b>Paper</b>	VMS or GPS or Compliance Camera	Simple, no electronic device required	Self reported, significant processing costs
<b>E-log</b>	VMS or GPS or Compliance Camera	No time lag and automated processing	Self reported, computer/ smart phone required
<b>Integrated E-log-Sensor</b>	VMS or Compliance Camera	Automation, independent data collection, less errors, ease of use	Development in progress
<b>Sensors <sup>1/</sup></b>			
<b>Drum Rotation</b>	Video	Tested in commercial fishing operations	Unreliable
<b>Hydraulic Pressure</b>	Video	Tested in commercial fishing operations	Fairly reliable but not 100%
<b>GPS</b>	VMS	Tested in commercial fishing operations	Fairly reliable but not 100%
<b>RFID</b>	Video	Easily implemented, used in many other applications	Untested in Fishery
<b>Proximity</b>	Video	Easily implemented	Untested in Fishery
<b>Sensor Data Model</b>	VMS and Video	Easily implemented	Untested in Fishery
<b>Video/Images <sup>1/</sup></b>			
<b>Rail <sup>2/</sup></b>	Compliance Camera and/or Landings	Tested in commercial fishing operations	Inconsistent data quality, requires video post processing
<b>Combined with Measure Brd</b>		Simple to implement	Needs further testing for rigorous analyses
<b>Bin (for Volume)</b>		Simple to implement	Needs further testing for rigorous analyses
<b>Graded Chute</b>		Simple to implement	Needs further testing for rigorous analyses
<b>Stereo Rail <sup>3/</sup></b>	Compliance Camera and/or Landings	Accurate length measurement	Untested in Fishery, Requires video post processing
<b>Chute</b>	Compliance Camera and/or Landings	Automation, Video post-processing costs lower, consistent species ID	Untested in Fishery, will require changes to fish handling