Capabilities of DIDSON

Walt Duffy, Matt Metheny,
Zack Larson and Kerrie Pipal

USGS science for a changing world

HUMBOLDT STATE UNIVERSITY

CALIFORNIA

DIDSON Technology

- Overview
- What DIDSON can do.
- What DIDSON cannot do.
- Accuracy and precision.

DIDSON Overview

- Need for assessing escapement has become more urgent.
  - Responding to ESA requirements
  - Supporting assessment of restoration and management.
- Cost effective methods for estimating escapement are needed.
  - Redwood Creek alone has 196 km of stream accessible to anadromous fishes, traditional survey methods for this and other basins are costly.

DIDSON Overview

- DIDSON uses high frequency sound to produce near video quality images of objects, fish and anything else.
- DIDSON is versatile and relatively easy to use, with training.
- Technology is advancing – Blueview technologies is developing software that may allow species separation (http://www.blueview.com).

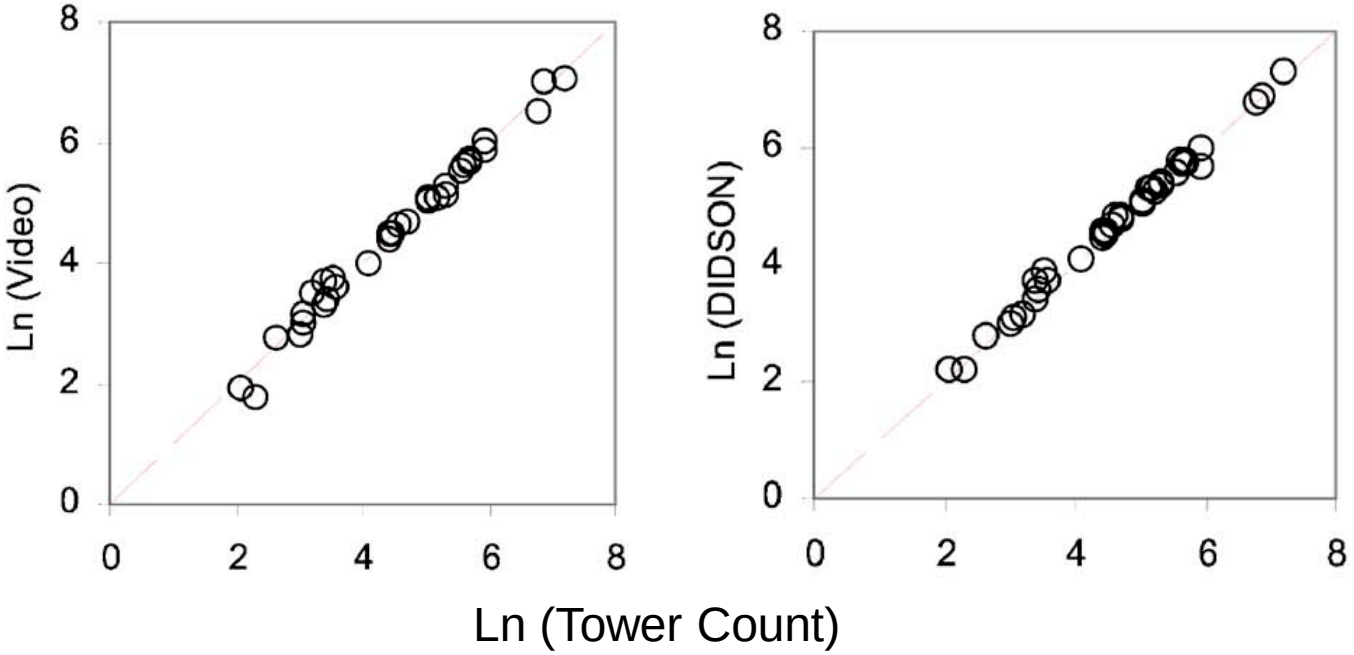
DIDSON Capabilities

- DIDSON can:
  - Provide 24-hour monitoring of spawning escapement.
  - Estimate net hourly upstream passage at rates of up to 7,300 fish/hour.
  - Establish run-timing curves for spawning areas.
  - Measure and record lengths of passing fish.

DIDSON Limitations

- DIDSON cannot:
  - Detect fish beyond ranges of 15 m (high frequency) or 40 m (low frequency).
  - Collect biological information other than length.
  - Detect external tags on fish.
  - Reliably identify different salmon species in a mixed group.
  - Automatically count fish at a rate of more than 1,250 fish/hour.

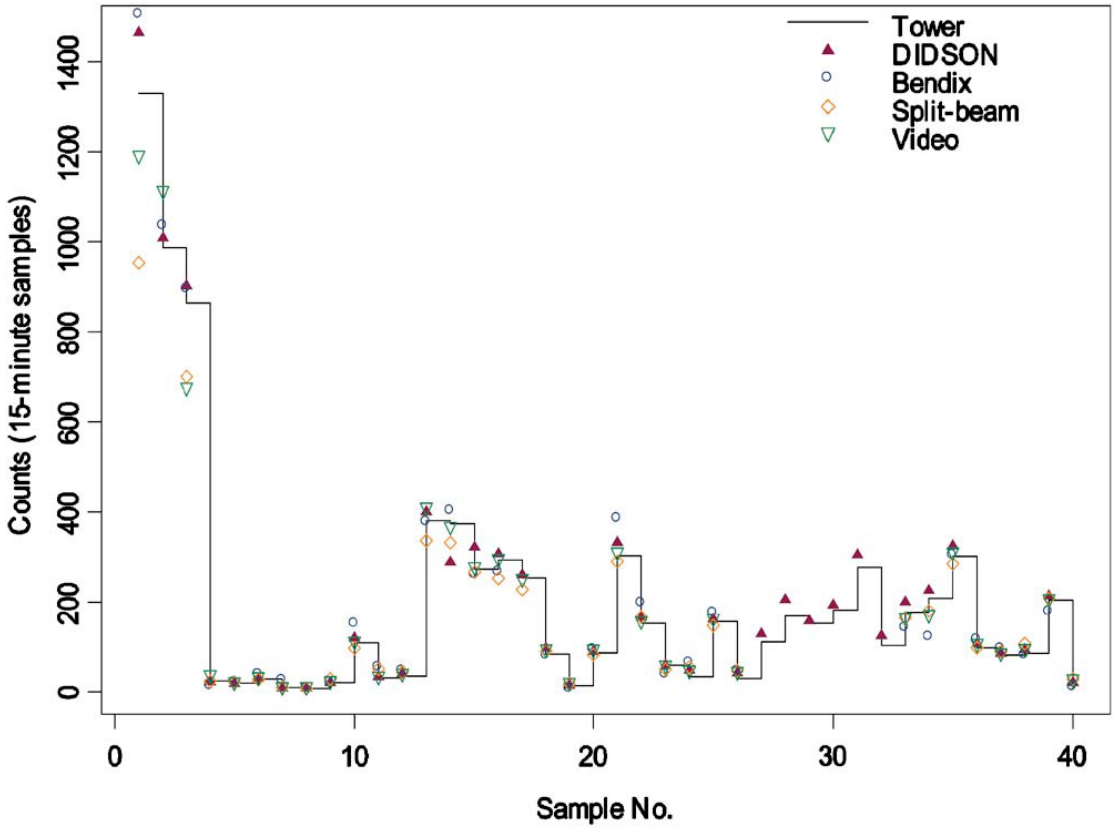
DIDSON Accuracy



Comparison of video and DIDSON counts of migrating sockeye salmon compared with tower counts. Maxwell and Gove (2007) J. Acoust. Soc. Am. 122:3364- 3377.

DIDSON Accuracy

Tower, DIDSON, split-beam and video counts of migrating sockeye salmon at 15 min intervals. Maxwell and Gove (2007) J. Acoust. Soc. Am. 122:3364- 3377.



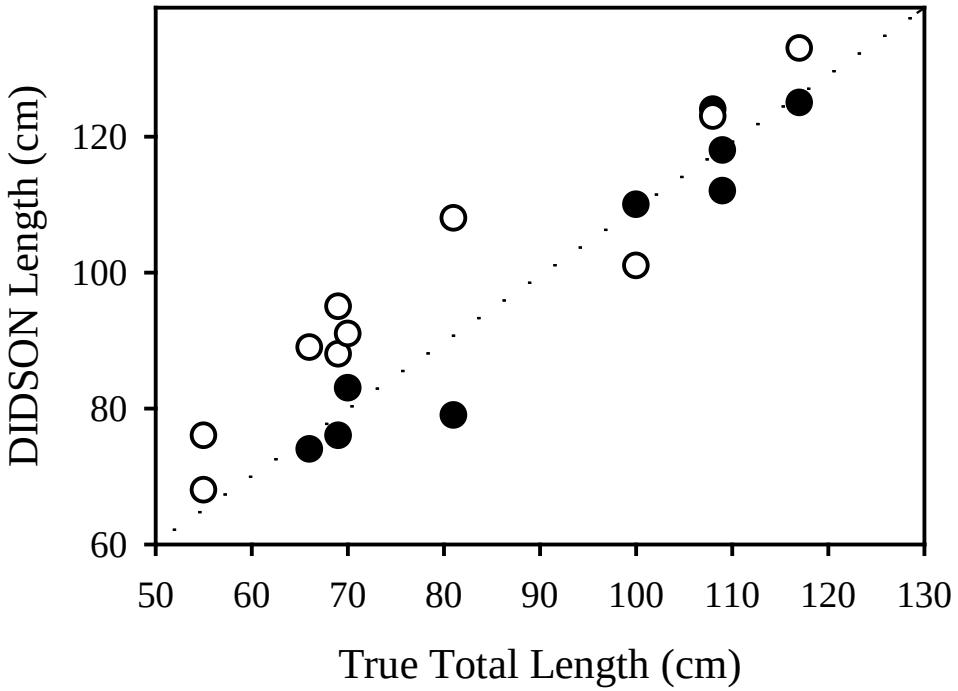
DIDSON Precision

TABLE I. The concordance correlation coefficient CCC and related statistics for sockeye salmon counts in the Wood River made by an observer in a tower paired with counts from the DIDSON, Bendix counter, split-beam sonar, and video.

Comparison	CCC	95% LC	*Precision*	Accuracy
Tower—DIDSON	0.994	0.990	0.997	0.998
Tower—Bendix	0.967	0.942	0.968	0.999
Tower—Split-beam sonar	0.951	0.891	0.966	0.985
Tower—Video	0.994	0.989	0.994	1.000

Maxwell and Gove (2007) J. Acoust. Soc. Am. 122:3364- 3377.

Accuracy in Measuring Fish Size



Size of salmon measured at distances of < 9 m from transducer (solid circles) and salmon measured ≥ 9 m from transducer (open circles).

Burwen, D. L., S. J. Fleischman and J. D. Miller. 2007. AK DFG, Fish Data Series No. 07-44.

Accuracy in Measuring Fish Size

- Burwen and colleagues concluded:
  - Length measurements of free-swimming fish were not biased.
  - Reasonably good estimates of fish length can be extracted from images at distances of< 12 m at high frequency.
- Cronkite reported a DIDSON bias
  - Salmon measured on DIDSON were, on average, 1.6 cm larger than salmon measured at counting fence.

Discussion and Questions