



Flowmeters

Variability & Suggested Practices

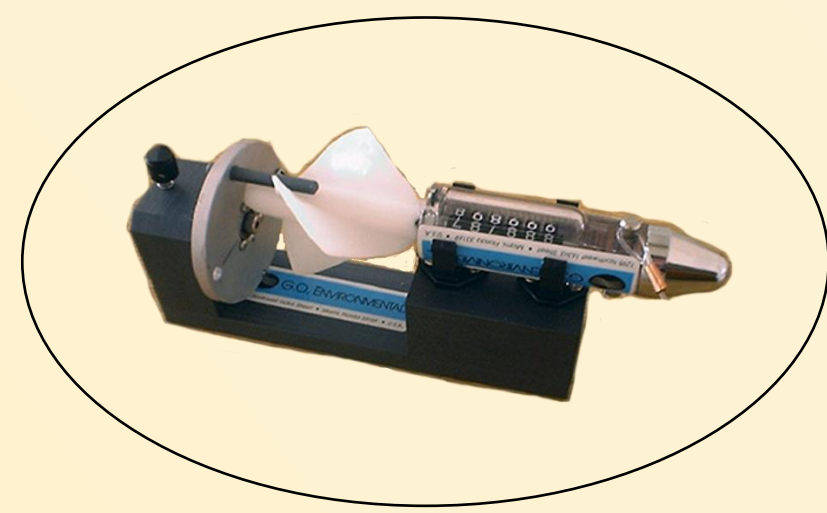


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California Dept. Fish and Wildlife, IEP Digital Workshop August, 2020

Monitoring studies in the San Francisco Bay-Delta region rely on flowmeters to track water volume sampled and estimate catch per unit effort (CPUE). Flowmeters measure volume using an impeller attached to a counter which turns at a rotor constant rate (k). This rate determines the conversion of flowmeter counts (M) to water volume. CPUE estimates are reliant on the accuracy and reliability of flowmeters. Improper use, care and calibration will lead to poor data quality

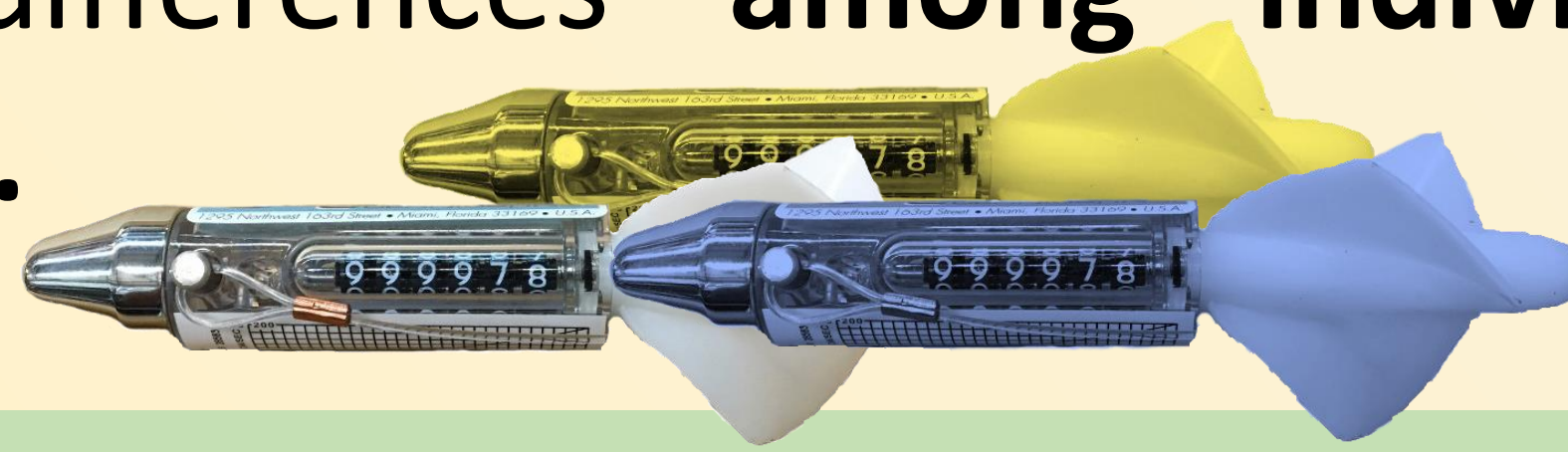
Recommended Best Practices for flowmeters:

- Flowmeters should be regularly **tested** (by Calibration Frame) **and calibrated annually** (using a flume) to monitor changes to the **rotor constant (k)**.



A General Oceanics Checker for flowmeter rotor spin resistance.

- Flowmeters should be **refurbished or replaced** when k no longer meets **factory specifications** or when there is a noticeable increase in rotor resistance when rotated manually.
- Flowmeters should have a **standard, and regular upkeep** following each sample period (i.e. rinsing with fresh and DI water).
- Surveys should **investigate potential variation** in flowmeter counts such as changes in **counts over time**, differences **among individual flowmeters**, or **among flowmeter brands**.



Calculating water volume (V, m^3) from flowmeter counts (M), rotor constant rate (k) and net mouth area (A, m^2)

$$V = \Delta M \times k \times A$$

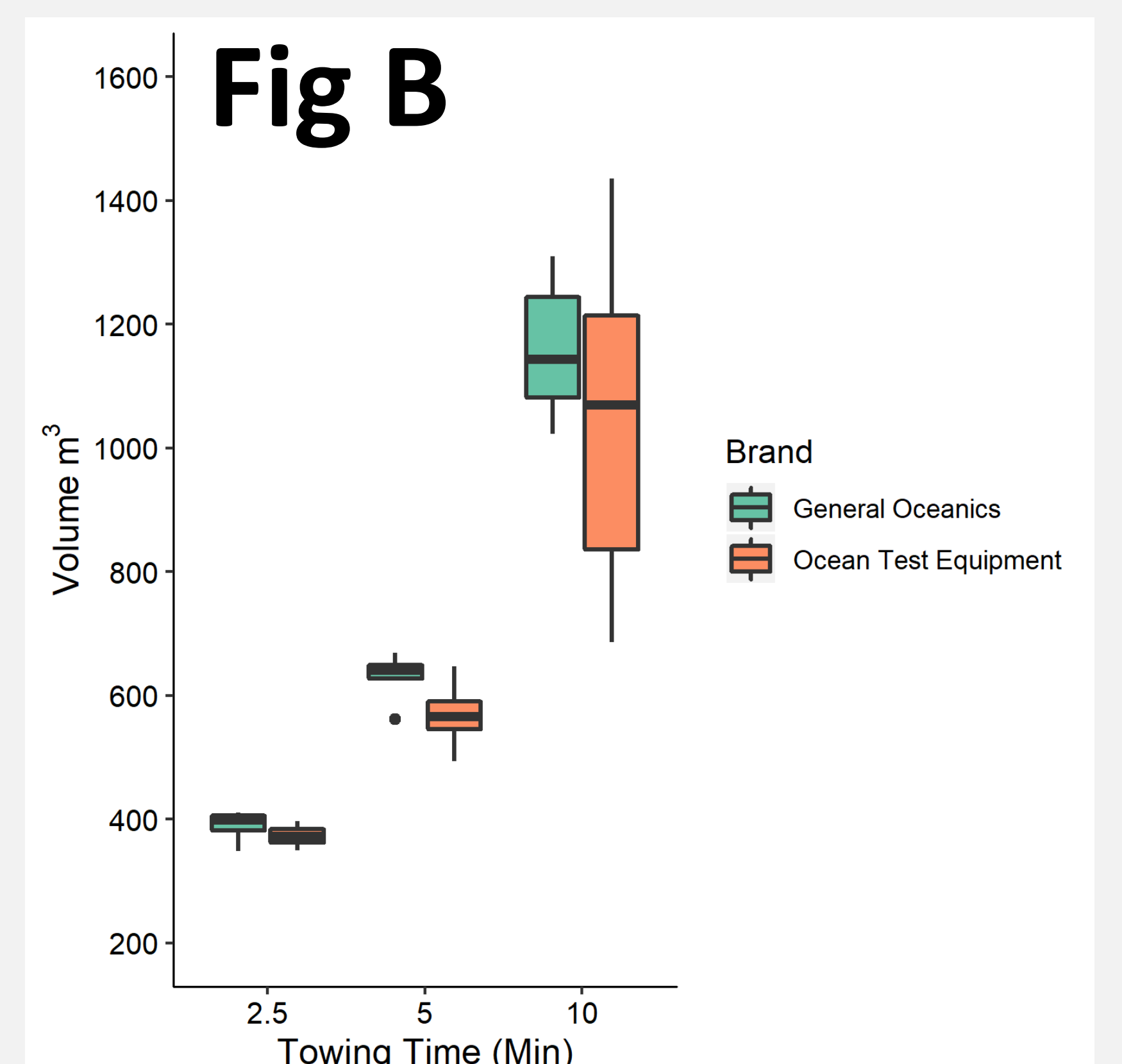
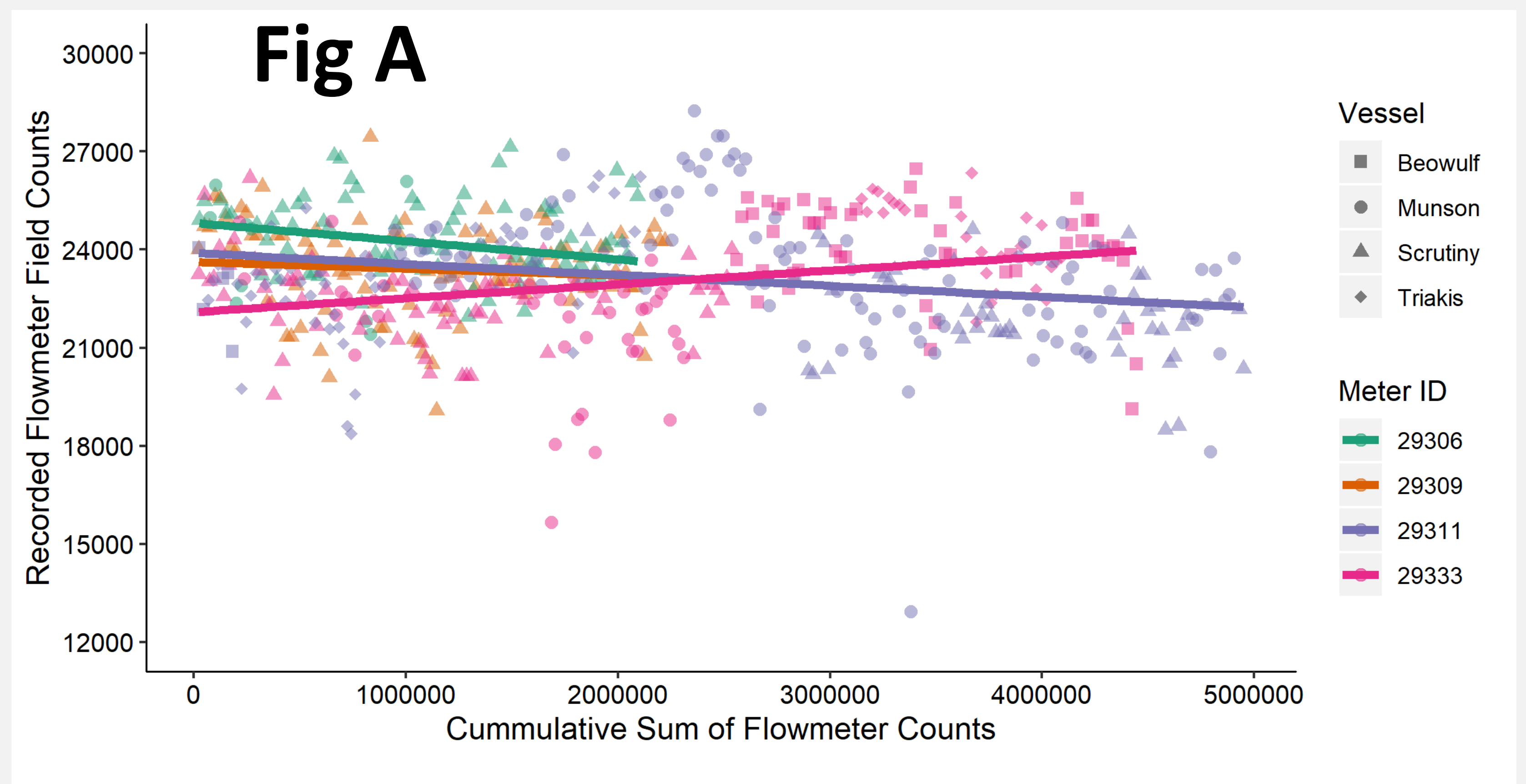
Scan here to participate in a **flowmeter survey** and **contact the authors** for additional information.



What do we know about Flowmeter variability?

Within a Summer Towntet season (2019), there were **no measurable trends** (Fig. A) in individual flowmeter cumulative counts (i.e. **total use of a flowmeter over time**) and the regularly **recorded flowmeter counts at each tow**. However **plenty of variation** was present within each individual flowmeter.

However, across survey seasons (2003-2019) a linear model found a **significant, negative relationship ($p=0.01$)** between **average flowmeter readings** and **cumulative flowmeter counts** of individual meters.



Among 2 Brands (Fig B. General Oceanics, and Ocean Test Equipment) we found no significant differences, **but different degrees of variation**.