# Using Cameras to Remotely Measure Angling Effort on Small Lakes

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## CAN CAMERAS PROVIDE SUITABLE ESTIMATES OF ANGLING EFFORT ?

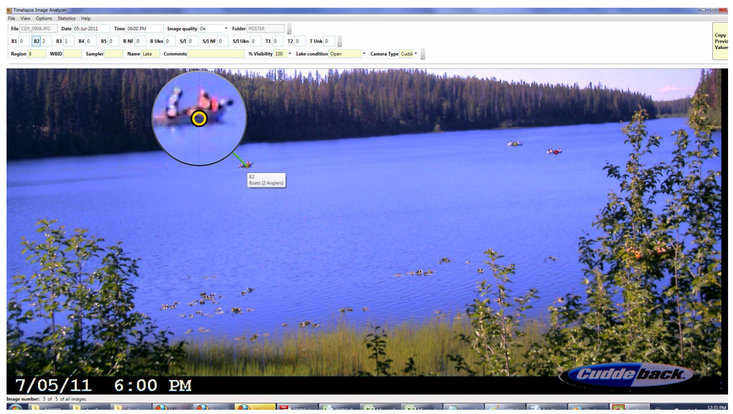
Quantifying angling effort using traditional methods (creel surveys, aerial counts) typically involves long hours and high costs. In an era of tight budgets and diminishing human resources, fisheries managers are seeking low cost alternatives.

Since 2007, we have been developing methods to estimate angling effort on small lakes using time-lapse cameras.

## A METHODOLOGY USING TIME-LAPSE PHOTOGRAPHS

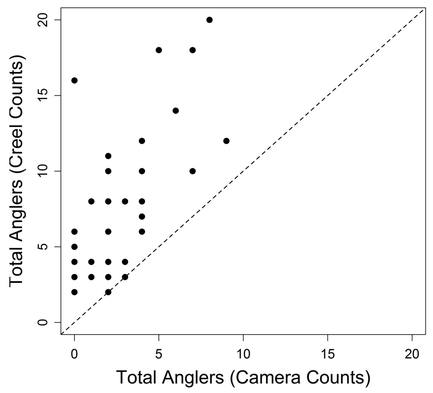
We installed time-lapse cameras at 58 small lakes in British Columbia. Lakes are under 100 hectares in size and are subject to a wide range of angling effort. Cameras were installed at each lake on a tree that provided the maximum view of the lake while minimizing theft concerns and set to a one hour exposure interval.


The number of anglers observed in the photos was counted for each hour using specially developed software (Greenberg and Godin, 2012).




Timelapse Image Analyzer

## CORRECTING FOR CAMERA BIAS IN EFFORT ESTIMATE


(Left) Depending on the camera angle and lake characteristics, images capture only a proportion of the lake (blue). (Right) Cameras underestimate angler effort when compared to instantaneous creel counts.

For non-zero creel counts, we estimated the proportion of anglers captured by camera ($p$) by comparing camera counts ($C_i$) with creel counts ($G_i$).

$$C_i \sim bin(p, G_i)$$

Camera Count # of Anglers

Creel Count # of Anglers

To estimate effort for a specific time period of interest (hour, day, season), the total number of anglers counted on the camera ($C_T$) and $p$ are used to calculate the number of anglers missed by the camera ($M$).

$$M \sim negbin(p, C_T)$$

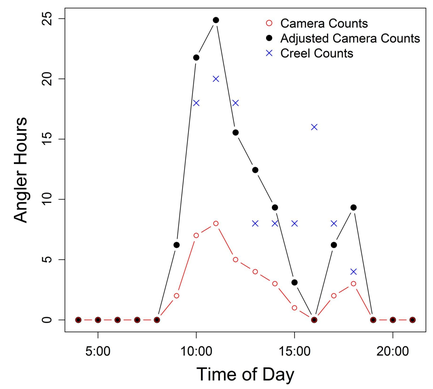
# of Anglers Missed by camera

Total # of Anglers in camera

Adjusted camera counts closely approximate hourly effort as measured by creel surveys. Zero counts cannot be reliably corrected using this methodology.

$$N = M + C_T$$

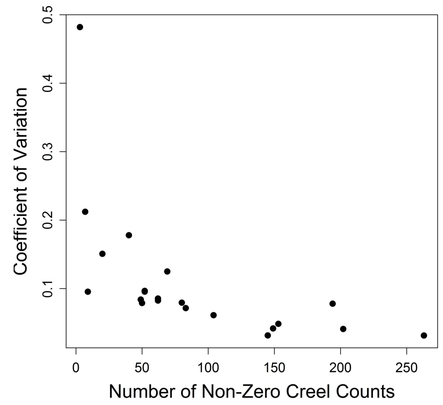
Total # of Anglers

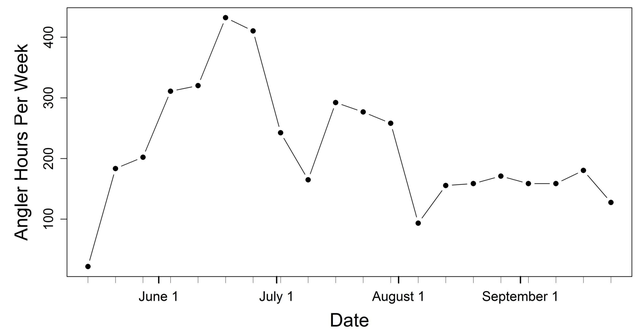



A comparison of hourly effort estimates for a single day for creel counts, camera counts and adjusted camera counts.

## ERROR IS MINIMIZED WITH GREATER NUMBER OF CREEL SURVEY COUNTS

We plotted the coefficient of variation in the effort estimate as a function of the number of non-zero creel counts for 21 lakes. The error in the estimate of angler effort is reduced when there are 50 or more non-zero creel counts at a given lake.




Seasonal distribution of weekly angling effort derived from time-lapse camera data at Doreen Lake, 2011.

## CONCLUSIONS

1.Time-lapse cameras provide a reliable method to estimate angler effort at reasonable cost.
2. Camera counts can be adjusted to account for missed anglers using creel counts.
3. Future research should focus on developing a method to correct for camera counts that show zero anglers.

## REFERENCES

Greenberg, S. and Godin, T. (2012) Timelapse Image Analysis Manual. Technical Report 2012-1028-11, Department of Computer Science, University of Calgary, Calgary, AB, Canada. http://grouplab.cpsc.ucalgary.ca/cookbook/index.php/Demos/TimelapseCoder

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