Notes on selected papers.

The following develop and describe approaches for modelling capture probability for individuals and capture occasions.

*Huggins, Richard M., and Paul SF Yip. “Statistical Analysis of Removal Experiments with the Use of Auxillary Variables.” Statistica Sinica 7, no. 3 (1997): 705–12.*

Derives the likelihood for within experiment estimation of capture probability using conditional likelihood. Core reference for us.

*Huggins, Richard, and Wen-Han Hwang. “A Review of the Use of Conditional Likelihood in Capture-Recapture Experiments.” International Statistical Review 79, no. 3 (December 1, 2011): 385–400. doi:10.1111/j.1751-5823.2011.00157.x.*

Core reference. As title suggests. Nice source of early references for conditional likelihood estimation: Sanathanan 1972. Also discuss modelling capture prob against covariates and discuss a GLM formulation for estimating capture probability using a “positive binomial” distribution (Patil, 1962).

*Conroy, Michael J., Jonathan P. Runge, Richard J. Barker, Matthew R. Schofield, and Christopher J. Fonnesbeck. “Efficient Estimation of Abundance for Patchily Distributed Populations via Two-Phase, Adaptive Sampling.” Ecology 89, no. 12 (December 1, 2008): 3362–70. doi:10.1890/07-2145.1.*

Core reference. Discusses 2 stage adaptive sampling for CMR to deal with patchily distributed species. Interest for us is that it develops a model for capture probability across experiments assuming a mixture distribution for density rather than a full model as we do, but they also try to estimate density. This is done in a Bayesian setting. Approach is related to Wyatt and Rivot et al. in its hierarchical nature. Method for estimating p used by Price and Peterson (2010).

*Price, Alison L., and James T. Peterson. “Estimation and Modeling of Electrofishing Capture Efficiency for Fishes in Wadeable Warmwater Streams.” North American Journal of Fisheries Management 30, no. 2 (April 1, 2010): 481–98. doi:10.1577/M09-122.1.*

Core reference: Evaluated single pass fishing by doing CMR to estimate capture prob related to covatiates such as wood density, conductance, turbidity, area, width, depth, substrate, section length. Plausible predictors found by using approximate GLMs, then these were taken forward into the Bayesian hierarchical model. Different variance structures were tested using DIC.

*Hedger, Richard D., Elvira de Eyto, Mary Dillane, Ola H. Diserud, Kjetil Hindar, Philip McGinnity, Russell Poole, and Ger Rogan. “Improving Abundance Estimates from Electrofishing Removal Sampling.” Fisheries Research 137 (January 2013): 104–15. doi:10.1016/j.fishres.2012.09.015.*

Context reference: Even though methods clearly exist for modelling capture probability, it is not routinely used. This paper is a recent example where they use “prior information” to constrain Carle and strubbe density estimates. Then they go on to say that this prior info can inform single pass fishings. Prior information was derived by fitting models to zippin estimates of capture probability using GAMS (presumably with a binomial family?). It’s not clear to me yet what the details are. However, the do find relationships with: total capture size, gradient, day of year and width – and also suggest that capture prob declines over passes by plotting estimated pass-wise capture prob.

*Niemelä, Eero, Markku Julkunen, and Jaakko Erkinaro. “Quantitative Electrofishing for Juvenile Salmon Densities: Assessment of the Catchability during a Long-Term Monitoring Programme.” Fisheries Research 48, no. 1 (August 2000): 15–22. doi:10.1016/S0165-7836(00)00113-2.*

Simple analysis of zippin estimates of p. Two time blocks are tried and plots comparing catchability vs density.

*Mäntyniemi, Samu, Atso Romakkaniemi, and Elja Arjas. “Bayesian Removal Estimation of a Population Size under Unequal Catchability.” Canadian Journal of Fisheries and Aquatic Sciences 62, no. 2 (February 1, 2005): 291–300. doi:10.1139/f04-195.*

Nice paper presenting a model for heterogeneous capture probability where more catchabable individuals are caught first hence capture prob declines with fishing pass.

*Bohrmann, Thomas F., and Mary C. Christman. “Evaluating Sampling Efficiency in Depletion Surveys Using Hierarchical Bayes.” Canadian Journal of Fisheries and Aquatic Sciences 69, no. 6 (May 24, 2012): 1080–90. doi:10.1139/f2012-035.*

Use HBM as in Wyatt to estimate capture probability and variance thereof for different sampling protocols to inform future sampling decisions. Good reference for us as they use HBMs and we are proposing a much simpler procedure. Though it does suggest we might need to do a simulation test to compare our method to a HBM procedure.

Cressie, Noel, Catherine A. Calder, James S. Clark, Jay M. Ver Hoef, and Christopher K. Wikle. “Accounting for Uncertainty in Ecological Analysis: The Strengths and Limitations of Hierarchical Statistical Modeling.” *Ecological Applications* 19, no. 3 (March 18, 2009): 553–70. doi:10.1890/07-0744.1.

Discussion reference: A pro HBM paper but does admit that models canbe so complex that pragmatic decisions have to be made.

Recent context papers

*Pregler, Kasey C., Jason C. Vokoun, Timothy Jensen, and Neal Hagstrom. “Using Multimethod Occupancy Estimation Models to Quantify Gear Differences in Detection Probabilities: Is Backpack Electrofishing Missing Occurrences for a Species of Concern?” Transactions of the American Fisheries Society 144, no. 1 (January 2, 2015): 89–95. doi:10.1080/00028487.2014.968291.*

Use of occupancy models to estimate capture prob. Models ranked by AICc, smooth AICc weights used to assess support.

*Rodtka, Mike C., Chad S. Judd, Peter K.M. Aku, and Kevin M. Fitzsimmons. “Estimating Occupancy and Detection Probability of Juvenile Bull Trout Using Backpack Electrofishing Gear in a West-Central Alberta Watershed.” Canadian Journal of Fisheries and Aquatic Sciences, January 19, 2015, 1–9. doi:10.1139/cjfas-2014-0175.*

Occupancy modelling. Hines at al 2010 used to assess habitat effects. Ranked capture prob models by AICc. Found relationship with conductivity.

References mentioned:

Patil, G. P. “Maximum Likelihood Estimation for Generalized Power Series Distributions and Its Application to a Truncated Binomial Distribution.” *Biometrika* 49, no. 1/2 (June 1, 1962): 227–37. doi:10.2307/2333484.

Sanathanan, Lalitha. “Estimating the Size of a Multinomial Population.” *The Annals of Mathematical Statistics* 43, no. 1 (February 1, 1972): 142–52.

Hines, J. E., J. D. Nichols, J. A. Royle, D. I. MacKenzie, A. M. Gopalaswamy, N. Samba Kumar, and K. U. Karanth. “Tigers on Trails: Occupancy Modeling for Cluster Sampling.” *Ecological Applications* 20, no. 5 (June 22, 2010): 1456–66. doi:10.1890/09-0321.1.