

Key References

The following list provides references to key publications relevant to statistical selectivity analysis.

Dempster, A.P., N.M. Laird and D.B. Rubin. 1977. Maximum likelihood with incomplete data via the E-M algorithm, *J. R. Stat. Soc., Series B*, **39**: 1-38.

A background paper that introduce the EM algorithm. It has no direct link to selectivity stuff, but the EM algorithm is used in estimating models for multiple hauls.

Efron, B. and Hinkley, D. V. 1978. Assessing the accuracy of the maximum likelihood estimator: Observed versus expected Fisher information. *Biometrika*, **65**, 3, 457-87.

Also a statistical background paper. It discuss the differences between the observed and expected information, used in estimating variances

Feller, W. 1968. *An Introduction to Probability Theory and its Applications*, vol. 1, 3rd ed. Wiley, New York.

A general text book on probability theory

Fryer, R.J. 1991. A model of between-haul variation in selectivity. *ICES J. Mar. Sci.* **48**: 281-290.
Jones, R.H., 1993. *Longitudinal data with serial correlation: a state-space approach*. Chapman and Hall.

A pioneer work, that proposed a method of combining multiple hauls with proper handling of both within and between-haul variation. The model has been widely adopted by the gear selectivity research community

Laird, N. M., and Ware, J.H. 1982. Random effects models for longitudinal data. *Biometrics* **38**: 963 -974.

A statistical background paper that has gained much attention in the statistical world. It has no direct link to selectivity work, but served as the foundation of Fryer's model of between haul variation.

Lehmann, E.L. 1983. *Theory of point estimation* , Wiley & Sons Inc., 511 pp.

A general text book on basic statistical topics. It contains much stuff on maximum-likelihood and other central topics. Advanced level.

Millar, R.B., 1992. Estimating the size-selectivity of fishing gear by conditioning on the total catch. *Journal of the American Statistical Association*, **87**: 962-968.

A pioneer work, that proposed a general method (SELECT) of estimating selectivity for **all** types of gear used in indirect fishing experiment. The model has been widely adopted by the gear selectivity research community.

The method is sometimes referred to as the "Millar & Walsh method", because it was presented in an ICES paper with an application on trawler-trawl. It appears that the full generality of the method is not fully recognised.

Millar, R.B., 1994. Sampling from trawl gears used in size selectivity experiments. *ICES J. Mar. Sci.*, **51**: 293-298.

An important paper that demonstrates how the SELECT method can be adopted to handle sub-sampled data in a statistical rigorous way.

Millar, R.B. and Fryer, R.J. 1999. Estimating the size-selection curves of towed gears, traps, nets and hooks. *Reviews in Fish Biology and Fisheries* **9**: 89-116.

This review paper sums up almost all important topics related to statistical selectivity analysis.

McCullagh, P. and J. A. Nelder 1989. Generalized linear models, 2nd edition. Chapman and Hall, London, 511 pp.

This is considered the key reference on generalized linear models. It contains substantial texts on binary data, which is relevant for selectivity analysis of two-compartment gears. Has a nice little appendix on Maximum Likelihood theory. Medium Level.

Wileman, D.A., Ferro, R.S.T, Fonteyne R., and Millar, R.B. (Editors) 1996. Manual of methods of measuring the selectivity of towed fishing gears. ICES Coop. Res. Rep. No. 215.

This cooperative report contains a substantial chapter on the analysis of selectivity data. It settles the SELECT method as the standard method to be used within the ICES community. It appears however to have had an impact beyond that.

The content is still valid, but new aspects have been added afterwards.