Some Thoughts on Time- or Spatially-Varying Selectivity

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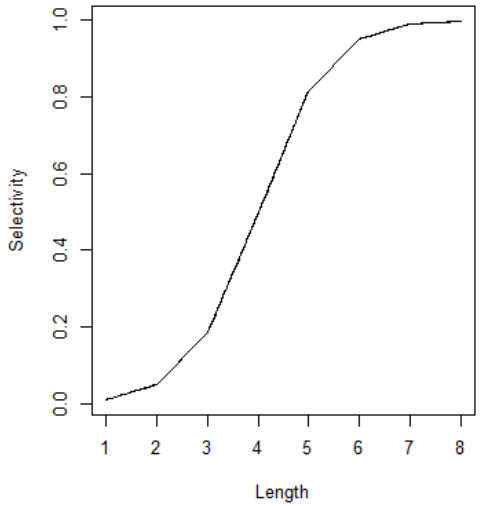
Basic Outline

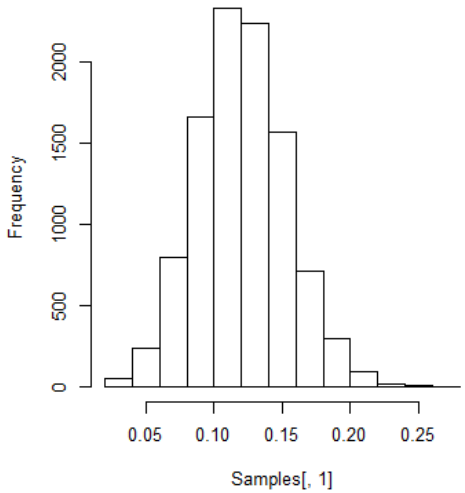
- 8 “length-classes”
- Selectivity is logistic (but may be stochastic)
- Population numbers are such that Selectivity * N = Constant (0.125)
- There are 10,000 replicates (shots…), each replicate is a multinomial sample of size 100.

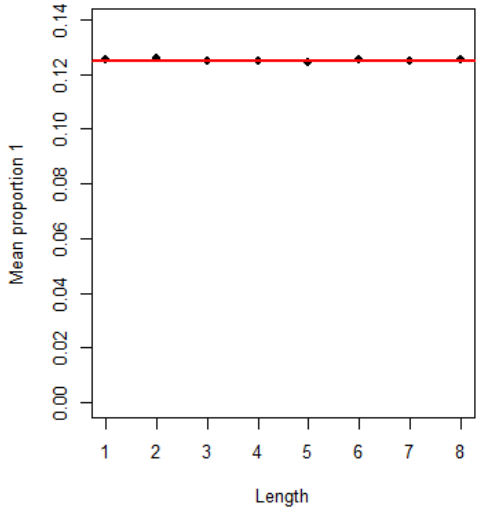
1: All is good

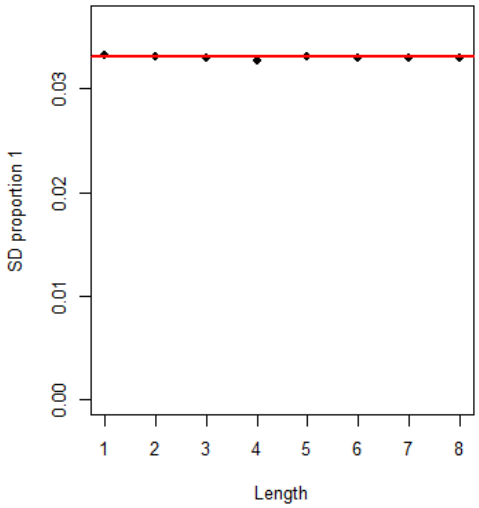
case, selectivity is the same for all
" – we have a traditional
omial process.

]	[,2]	[,3]	[,4]	[,5]	[,6]	[,7]	[,8]
0.0011	-0.0001	-0.0001	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
-0.0001	0.0011	-0.0002	-0.0002	-0.0001	-0.0002	-0.0002	-0.0002
-0.0001	-0.0002	0.0011	-0.0002	-0.0002	-0.0002	-0.0002	-0.0001
-0.0002	-0.0002	-0.0002	0.0011	-0.0001	-0.0001	-0.0001	-0.0002
-0.0002	-0.0001	-0.0002	-0.0001	0.0011	-0.0002	-0.0001	-0.0002
-0.0002	-0.0002	-0.0002	-0.0001	-0.0002	0.0011	-0.0002	-0.0002
-0.0002	-0.0002	-0.0002	-0.0001	-0.0001	-0.0002	0.0011	-0.0001
-0.0002	-0.0002	-0.0001	-0.0002	-0.0002	-0.0002	-0.0001	0.0011







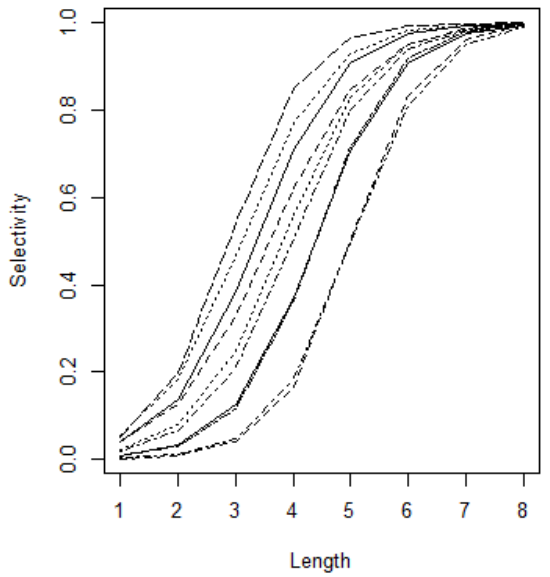


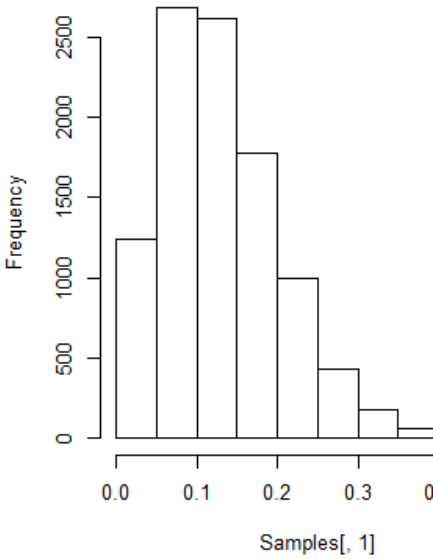
2: Time-varying selex

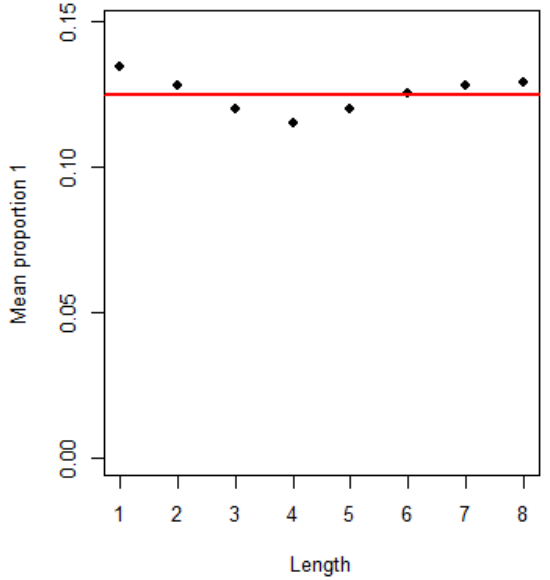
case, length-at-50%-selectivity is
5) and the selectivity width is log-
with mean 2 and CV 0.1

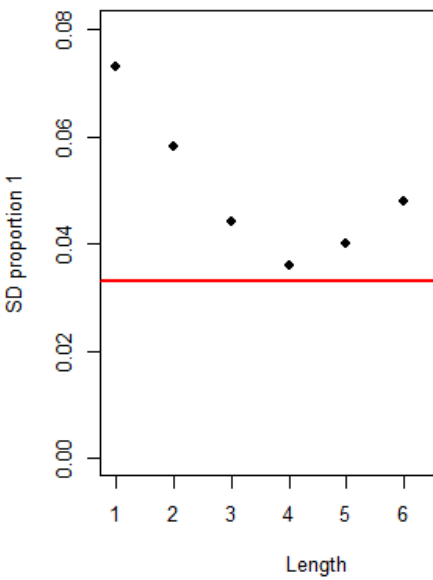
	[,2]	[,3]	[,4]	[,5]	[,6]	[,7]	[,8]
0053	0.0027	0.0012	-0.0004	-0.0016	-0.0022	-0.0024	-0.0025
0027	0.0034	0.0011	-0.0002	-0.0012	-0.0018	-0.002	-0.002
0012	0.0011	0.0019	0.0001	-0.0007	-0.0011	-0.0012	-0.0013
0004	-0.0002	0.0001	0.0013	0	-0.0002	-0.0003	-0.0003
0016	-0.0012	-0.0007	0	0.0016	0.0006	0.0006	0.0007
0022	-0.0018	-0.0011	-0.0002	0.0006	0.0023	0.0012	0.0012
0024	-0.002	-0.0012	-0.0003	0.0006	0.0012	0.0027	0.0014
0025	-0.002	-0.0013	-0.0003	0.0007	0.0012	0.0014	0.0028

s are much larger than would be
pected under a multinomial.
e expected proportions are
iased".









3: Case 2 plus offset

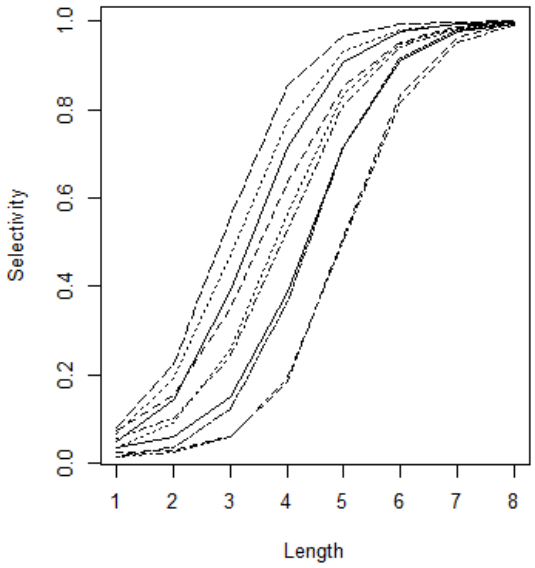
ase:

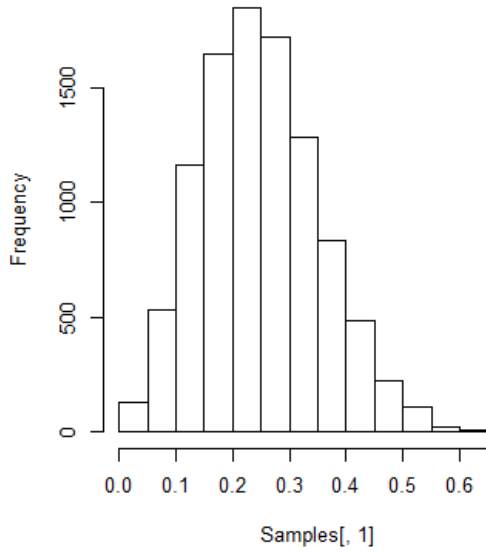
$$O + (1-O) / \left(1 + \exp(-\ell \, \mathrm{n}19(L - L_{50}) / \delta\right)$$

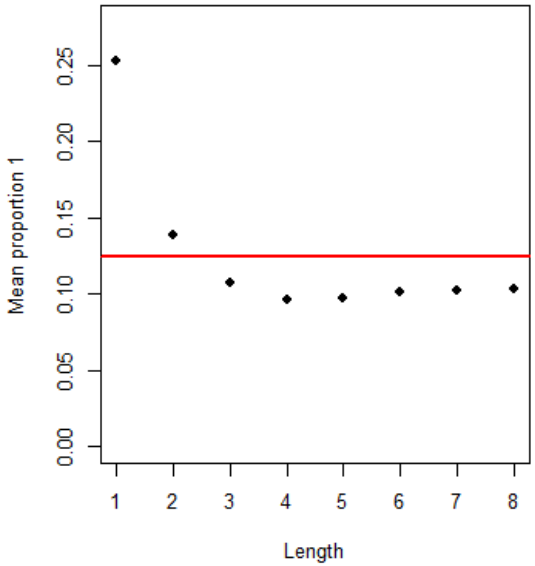
beta distribution(1,50)

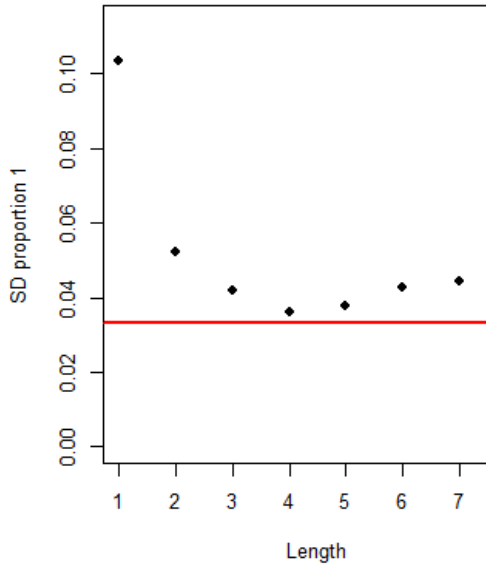
]	[,2]	[,3]	[,4]	[,5]	[,6]	[,7]	[,8]
0.0107	0.0014	-0.0007	-0.0017	-0.0022	-0.0025	-0.0025	-0.0025
0.0014	0.0027	0.0007	-0.0002	-0.0008	-0.0012	-0.0013	-0.0013
-0.0007	0.0007	0.0018	0.0003	-0.0002	-0.0005	-0.0006	-0.0007
-0.0017	-0.0002	0.0003	0.0013	0.0002	0.0001	0	0
-0.0022	-0.0008	-0.0002	0.0002	0.0014	0.0005	0.0005	0.0006
-0.0025	-0.0012	-0.0005	0.0001	0.0005	0.0018	0.0009	0.0009
-0.0025	-0.0013	-0.0006	0	0.0005	0.0009	0.002	0.001
-0.0025	-0.0013	-0.0007	0	0.0006	0.0009	0.001	0.002

e impact of an offset is NOT
mmetric
sually this is not very different from
e base analysis









4: Offset only

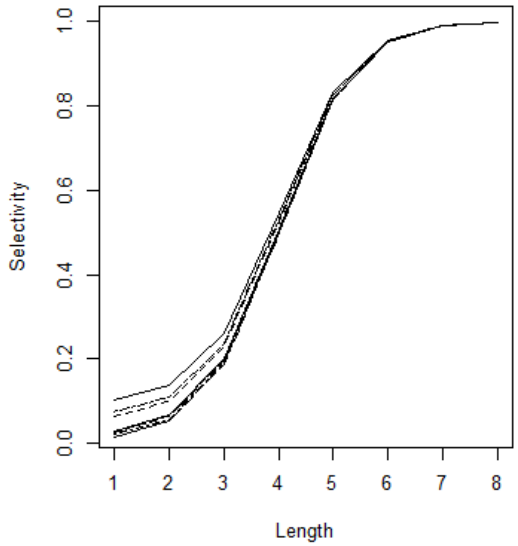
ase:

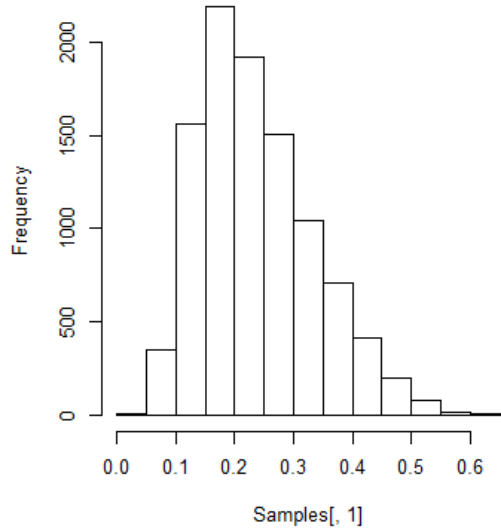
$$O + (1-O) / \left(1 + \exp(-\ell \, \mathrm{n}19(L - L_{50}) / \delta\right)$$

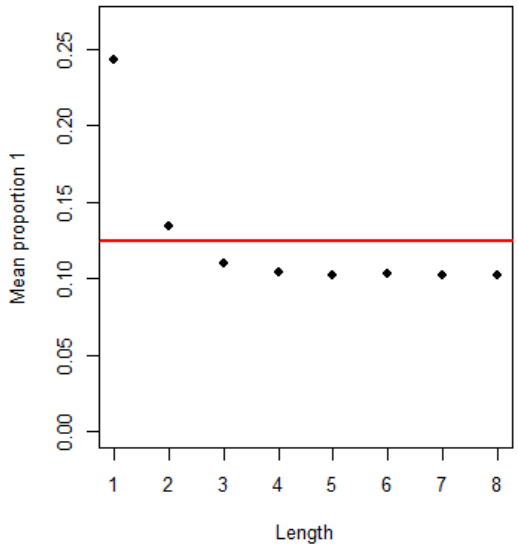
beta distribution(1,50)

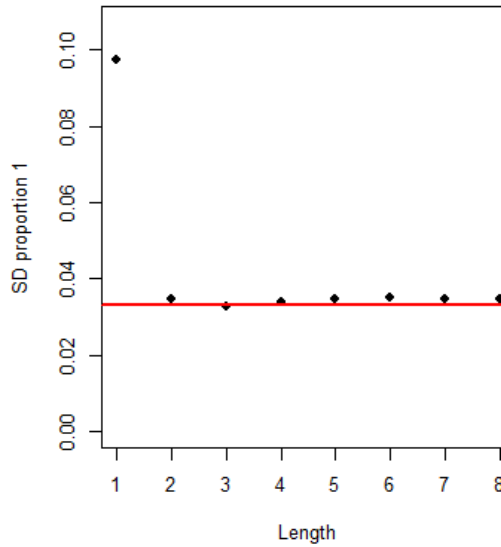
1]	[,2]	[,3]	[,4]	[,5]	[,6]	[,7]	[,8]
0.0095	0.0003	-0.0013	-0.0016	-0.0017	-0.0017	-0.0017	-0.0017
0.0003	0.0012	-0.0002	-0.0002	-0.0002	-0.0003	-0.0003	-0.0003
-0.0013	-0.0002	0.0011	0	0.0001	0.0001	0.0001	0.0001
-0.0016	-0.0002	0	0.0012	0.0001	0.0001	0.0002	0.0002
-0.0017	-0.0002	0.0001	0.0001	0.0012	0.0002	0.0002	0.0002
-0.0017	-0.0003	0.0001	0.0001	0.0002	0.0012	0.0002	0.0002
-0.0017	-0.0003	0.0001	0.0002	0.0002	0.0002	0.0012	0.0002
-0.0017	-0.0003	0.0001	0.0002	0.0002	0.0002	0.0002	0.0012

e impact of an offset is NOT
mmetric
ood Luck seeing THIS difference in
lectivity..









Conclusions

Small changes in selectivity (between shots in this case, but also between years) can change:

- The expected value of proportions (especially those that are based on low selectivity and high abundance)
- The variance of the proportions is not independent of the length-class, but depends on the abundance to which the proportion relates and selectivity)

Next steps:

- We should probability consider multivariate normal likelihood functions.
- Someone (Bob) should plot the variances of the proportions from the surveys relative to that expected under a multinomial distribution (or even the robust normal for proportions).