SUBSAMPLING ACCURACY IN BEAM TRAWL CATCHES

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Figure 1: Catch Sorting in Progress

Introduction

In commercial beam trawling data on fish catches is routinely available, while composition of invertebrate discards is ignored. However, from an ecosystem perspective such data is equally important yet is highly labor intensive to acquire. Subsampling the discards, and accepting the error this inherently imposes, is the only option. Here we investigate these error rates, which will allow for more accurate data or estimates in discard composition.

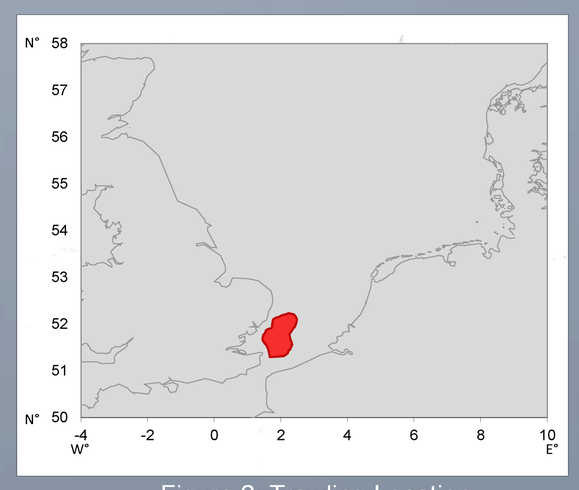


Figure 2: Trawling Location

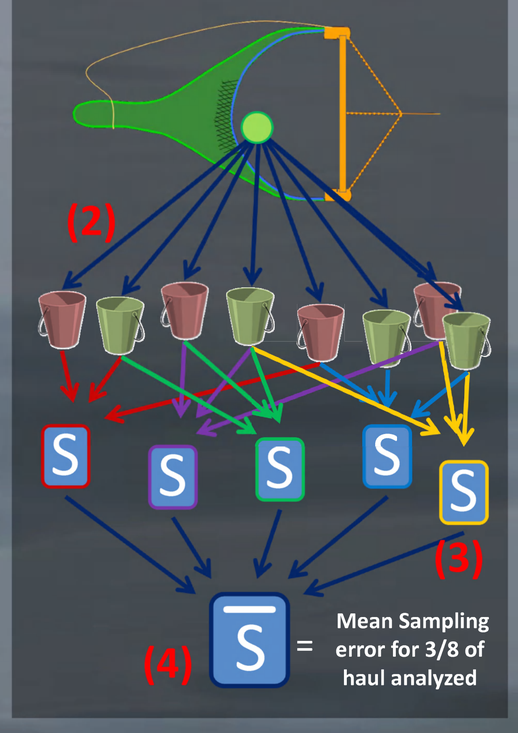
Materials & Methods

Twelve trawls were performed, in February 2009(F1-F3), February 2010(F4&F5), April (A1) and November2011 (N1-N6) at the location in Fig. 2. Every species x trawl combination was assigned to an abundance category(1) based on an abundance index (n). Hauls were subdivided into 10L buckets(2) and individuals were identified. Different numbers of buckets(from 1 to all) from a trawl were used to simulate different subsample sizes. For a large number of random recombination's of buckets, a sampling error (S) was calculated(3) and from all these a mean error and a confidence interval was derived(4). A similar approach was then used to calculate the mean number of species in a subsample of a certain size.

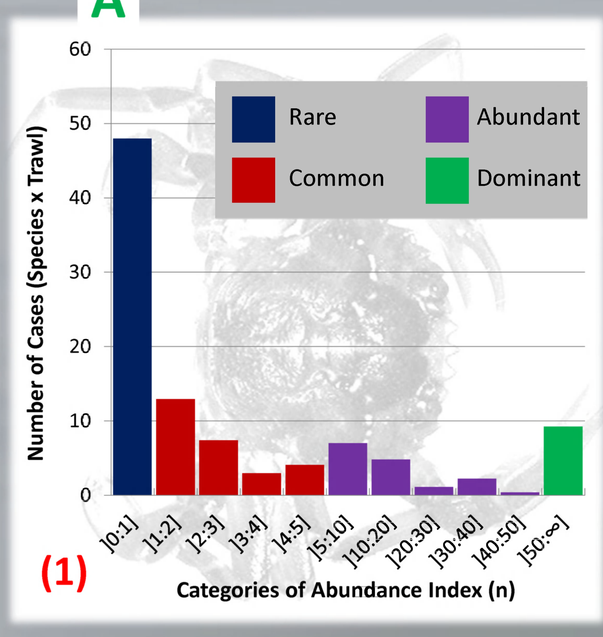
$$n = 10 * ({}^{T}/_{W})$$

$$S = \left| \frac{{}^{a}/_{p} - T}{T} \right|$$

p= proportion of catch analyzed
a= Species abundance in subsample
T= Species abundance in haul
W= Total weight of haul



A



Species	Individuals	%
Asterias rubens	24068	47,19
Echinidea sp.	21324	41,81
Buccinum undatum	901	1,77
Pagurus bernhardus	675	1,32
Liocarcinus depurator	636	1,25
Liocarcinus holsatus	608	1,19
Aphrodita aculeata	416	0,82
Palaemoninae sp.	318	0,62
Necora puber	247	0,48
Ophiura ophiura	236	0,46
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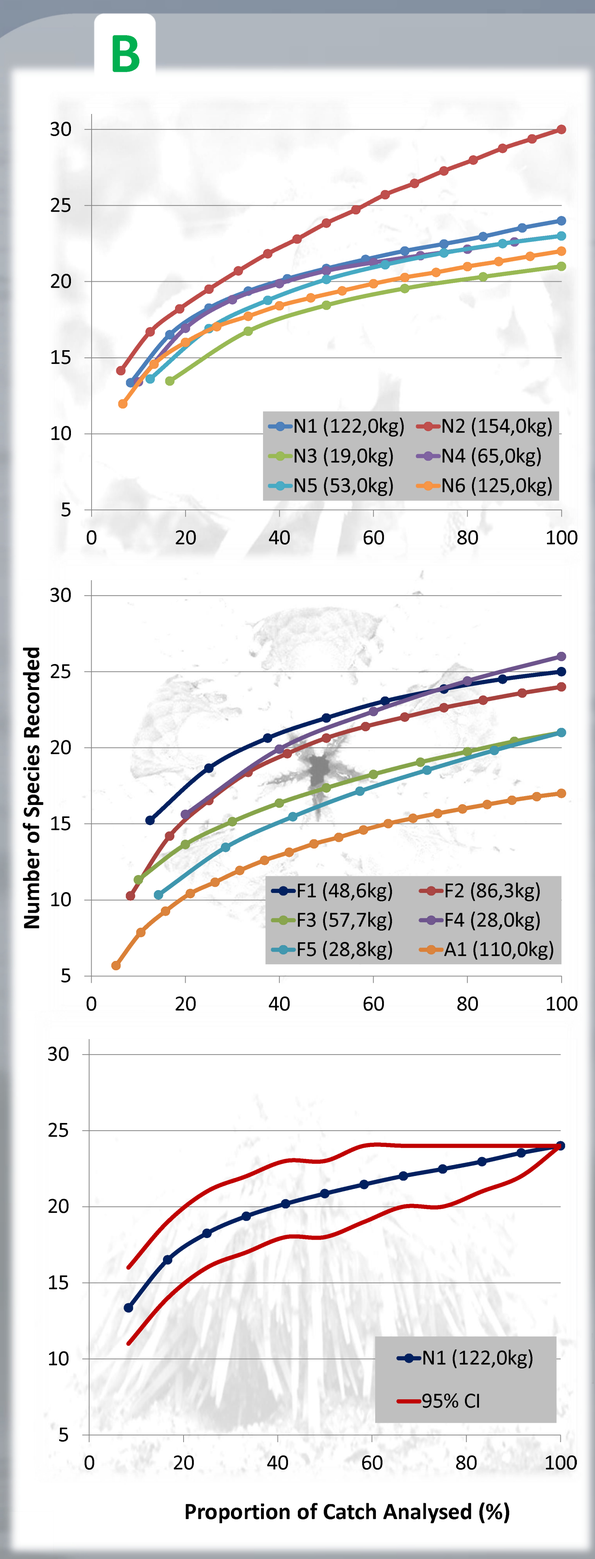
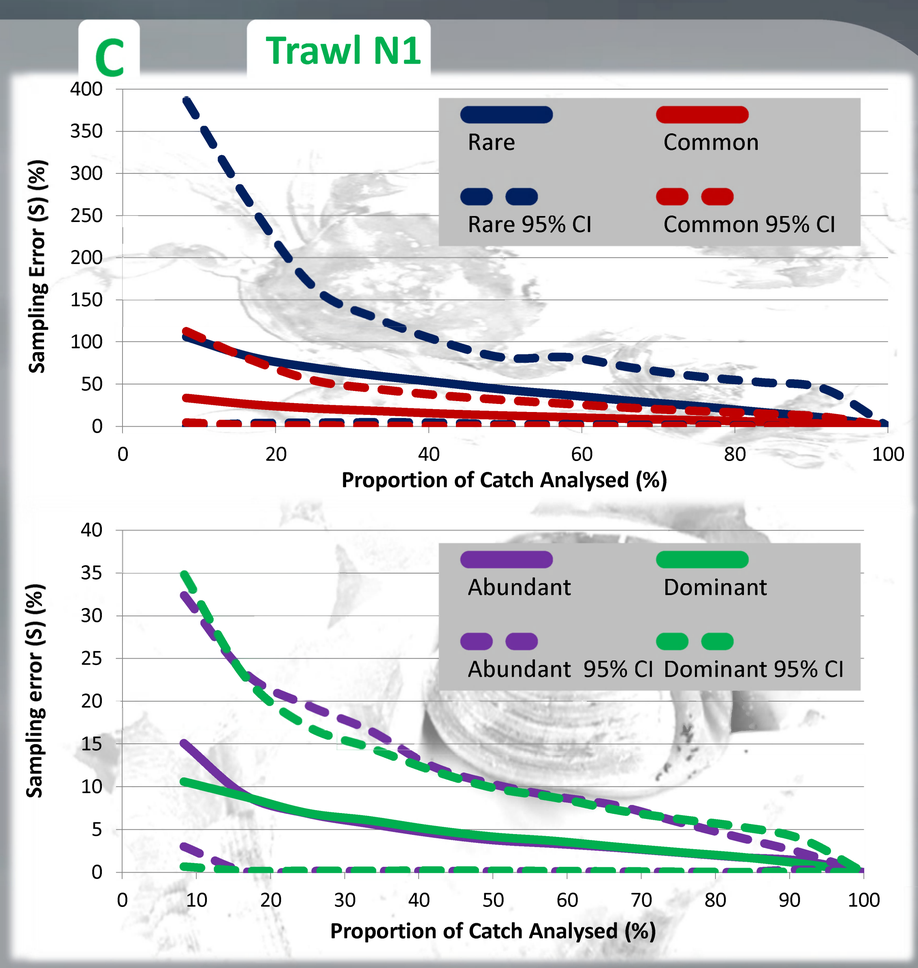
Table 1: Top Abundant Species

B



C



Discussion

(A) Species Abundances

All hauls were highly dominated by starfish and sea urchins. A majority of species was found to be rare.

(B) Species Richness

An average of 23 species per trawl was found. Despite large differences in catch weight there was comparatively little variation in number of species. Most trawls follow a similarly shaped curve regardless of their weight or number of species. For N1 the confidence interval showed a constant range over al subsample sizes.

(C) Sampling Error

Results for N1 are given as example, other trawls revealed similar patterns. Average error decreased with increasing subsample size. Rare species showed the highest error rates while common species had intermediate error rates. For abundant & dominant species errors were up to 10 times lower and surprisingly similar to each other. This indicates that after a certain abundance threshold is reached(around 5ind./10kg), error rate is unlikely to drop much further, even at highest abundances.

Future Prospects

Currently most results are represent all trawls individually. In the next step, we aim to produce overall results for all trawls combined. Interpolation and/or a general linear mixed model approach should allow for this, while also accounting for the complex interdependence of all data points.

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