Northeast Fisheries Science Center Reference Document 10-05

Estimation of Albatross IV to Henry B. Bigelow Calibration Factors

edited by TJ Miller, C Das, PJ Politis, AS Miller, SM Lucey, CM Legault,
RW Brown, and PJ Rago

May 2010

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NOAA National Marine Fisheries Serv., 166 Water St., Woods Hole MA 02543

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Contents

1 Introduction

Fishery-independent surveys are an important source of information for stock assessments worldwide. At the Northeast Fisheries Science Center (NEFSC), bottom-trawl surveys have been conducted annually for nearly half a century (Azarovitz *et al.* 1997) and are integral to assessments of the many groundfish as well as some pelagic and invertebrate stocks. Because of temporary break-downs and technological advances in gear efficiency and vessel performance, there are periodic changes in vessels and(or) gears (Byrne and Fogarty 1985 and Byrne and Forrester 1991). Experiments to measure the relative catchability of two or more vessel-gear combinations are necessary to rigorously combine their information in analyses such as stock assessments (Anonymous 1992).

At 636 stations, standardized tows were made by both the R/Vs *Albatross IV* and *Henry B. Bigelow* in 2008. These tows span both the traditional spring and fall survey seasons as well as some site-specific tows made during June and July. The reviewers of the calibration study design recommended using an estimator of the ratio of the average catches corresponding to the stratified random sampling design carried out during the spring and fall surveys (NEFSC 2007), but the availability of the site-specific stations may complicate the usage of this estimator. The design-based inference associated with the estimator of the ratio does not allow statistical testing of association of factors such as season, station-type, etc., with the expected catches by the two vessels or the calibration factor that relates them. Testing these associations requires assumptions of models for the data generating mechanism, but appropriateness of an estimator often depends on how similar an assumed and true distribution are.

The ultimate goal of this work is to provide a statistically rigorous approach to estimating the calibration factor for catches measured in numbers and total biomass. To this end, we first consider a suite of candidate calibration factor estimators and assess their statistical behavior through simulation. Some of these estimators, such as the quasi-likelihood estimator are previously considered in the literature (e.g., Pelletier 1998 and Lewy *et al.* 2004). For each species, we exclude some classes of estimators through tests of correlation of the paired tows at each station and tests of goodness-of-fit. We also evaluate statistical evidence for season-specific estimates of calibration factors.

2 Methods

2.1 General approach

For the calibration experiment the main goal is to estimate the ratio of the catchabilities (q) of the *Henry B. Bigelow* and *Albatross IV*. We assume that the expected catch (C) of the *Albatross IV* at station i is $E(C_{Ai}) = q_A D_{Ai}$ and that of the *Henry B. Bigelow* is $E(C_{Bi}) = q_B D_{Bi}$ where D_{Ai} and D_{Bi} are the densities available to the *Albatross IV* and *Henry B. Bigelow*, respectively, at station i. When the densities available to the two vessels at the station are the same, $D_{Ai} = D_{Bi} = D_i$ and the ratio of the two expectations is

$$\rho = q_B / q_A, \tag{1}$$

the calibration factor. Note that the densities among stations need not be constant. The temporal and spatial offset of the two tows at each station was intended, at least for predominant groundfish, to negate the effect of the tows on each other while keeping available densities equivalent (for full details on the design of the calibration experiment see NEFSC 2007 and Brown *et al.* 2009). If so, then eq. 1 is satisfied. However, note that our definition of catchability here combines the intensity of capture and the duration of the tows so that for vessel v, $q_v = A_v e_v$ where A_v is the area/volume swept and e_v is the probability of capture given an encounter. If the tow duration for the *Henry B. Bigelow* changes in the future, then calibration factors that account for differences in swept area or volume would have to be estimated.

2.2 Candidate estimators

We present several candidate estimators that derive from different degrees and types of assumptions on the data generating mechanism and include non-parametric, quasi-likelihood, and maximum likelihood estimators (MLEs). Specifically we discuss the 1) non-parametric estimator of the ratio (ratio estimator), 2) binomial-based quasi-likelihood estimator, 3) independent Poisson MLE, 4) negative multinomial MLE, 5) beta-binomial MLE, 6) independent negative binomial MLE, and 7) gamma MLE. Of those estimators, the second through sixth are specific to catches measured in counts, which will be of primary interest. The gamma MLE is for calibration of average fish weight for each vessel which we use with the calibration factor for counts to obtain a calibration factor for total biomass. The ratio estimator can be applied to either counts or total biomass. Most of the candidate estimators for counts assume that the density observed at each station is the same for both vessels, but they also derive from different assumptions on the variability of the catches and the calibration factor from station to station and the correlation of catches at each station.

For some models where maximum likelihood estimators (MLEs) are available and all of the information on the calibration factor can be obtained by conditioning on the total catch by both vessels at a given station. Because many of the calibration factor estimators are identical in form, we opt not to present any simulation results that are repetitive. For example, because the non-parametric, independent Poisson MLE, binomial MLE, binomial-based quasi-likelihood estimator, independent negative binomial (as parameterized here) MLE, and negative multinomial MLE are identical, bias of these estimators is identical.

All simulation studies pertain to counts-based calibration factor estimation. The biomass-based calibration factor estimators are used with the data obtained from the calibration study and measures of goodness-of-fit are used to determine the appropriate model for either counts- or biomass-based calibration factors.

2.2.1 Ratio estimator

The ratio estimator is a classic non-parametric estimator. For design-based inference, the form depends on the sampling design used to collect the data. Although the NEFSC spring and fall bottom trawl surveys are conducted according to a stratified random sampling design, we also have data from a set of paired tows conducted outside of the survey at specific sites. As such, our analyses uses a non-parametric model-based framework where data at all stations are independently distributed with equal mean and variance. The calibration factor estimator is simply the ratio of the mean (or sum of) catches of the *Henry B. Bigelow* over all S stations to that of the *Albatross IV*,

$$\hat{\rho}_R = \frac{\sum_{i=1}^{S} C_{Bi}}{\sum_{i=1}^{S} C_{Ai}} \tag{2}$$

(e.g., Cochran 1977) and the (delta method-based) variance estimator is

$$\hat{V}\left(\hat{\rho}\right) = \hat{\rho}^2 \left[\frac{\hat{V}\left(\overline{C}_{Ai}\right)}{\overline{C}_{Ai}^2} + \frac{\hat{V}\left(\overline{C}_{Bi}\right)}{\overline{C}_{Bi}^2} - 2\frac{\widehat{Cov}\left(\overline{C}_{Ai}, \overline{C}_{Bi}\right)}{\overline{C}_{Ai}\overline{C}_{Bi}} \right].$$

2.2.2 Independent Poisson MLE and binomial MLE

When the catches in counts ($C \equiv N$) of the *Albatross IV* and *Henry B. Bigelow* at station i are independent and Poisson distributed with means $E(N_{Ai}) = q_A D_i$ and $E(N_{Bi}) = q_B D_i = \rho E(N_{Ai})$,

$$N_{vi} \sim Poisson\left(\mu_{vi}\right), \tag{3}$$

the maximum likelihood estimator of the calibration factor is identical to the ratio estimator, eq. 2 (see Appendix A). However, the variance of the two estimators are different.

If we condition on the sum of the two independent Poisson random variables $N_{Ai} + N_{Bi} = N_i$, the catch for the *Henry B. Bigelow* is binomial distributed $Bin(N_i, p)$ (see Appendix B) where

$$p = \frac{\rho}{\rho + 1}.$$

The MLE of the calibration factor is also still identical to eq. 2 (Appendix D). Because the variance of the estimator should be equivalent to that of the independent Poisson MLE we will only use the binomial MLE in the simulation study.

2.2.3 Negative multinomial MLE

When the catches of the *Albatross IV* and *Henry B. Bigelow* at station i are independent and Poisson distributed as in eq. 3, but the density at the station is gamma distributed,

$$d_i \sim Gamma\left(d, r\right) \tag{4}$$

where d is the mean density over all stations and r is a measure of dispersion such that $V(d_i) = d^2 / r$, catches of the two vessels are jointly distributed negative multinomial with means and variances,

$$\mu_v = q_v d$$

and

$$V(N_{vi}) = \mu_v + \frac{\mu_v^2}{r}$$

and the covariance of the two catches at station i is

$$Cov\left(N_{Ai}, N_{Bi}\right) = \frac{\mu_A \mu_B}{r}.$$

Notice that as r increases, the tows become uncorrelated as well as marginally approach Poisson in distribution. Note also the MLE is identical to the ratio estimator (see Appendix C) and that conditional on the total $N_i = N_{Ai} + N_{Bi}$, the catch by the *Henry B. Bigelow* is binomial distributed $Bin(N_i, p)$ (see Appendix B). So again, so will not present MLE results using the joint negative multinomial probability model.

Here, the total catch at the station is negative binomial distributed whereas that for the binomial in Section 2.2.2 is Poisson. As such, there will be more variability in the total information available for estimating the calibration factor in the present data generating scenario.

2.2.4 Quasi-likelihood estimator

The specific quasi-likelihood estimator we consider here assumes the same mean as the binomial model, but allows variance to differ,

$$E(N_{Bi} \mid N_i) = N_i p,$$

$$V(N_{Bi} \mid N_i) = N_i p(1-p)\sigma^2,$$

where σ^2 is often called the ``over-dispersion" parameter (e.g., McCullagh and Nelder 1989), but since its range is $0 < \sigma^2 < \infty$, it can actually deal with less dispersion than the binomial model. Note also that σ^2 is usually a constant (as we assume here) rather than a function of covariates or the size of the total catch N_i. As the calibration factor estimator is the same as the binomial and ratio estimators, any bias will be the same, but because the variance estimator will differ we provide results on the confidence interval coverage of this estimator.

2.2.5 Beta-binomial MLE

When the proportion of the catch by the *Henry B. Bigelow* at station i is binomial distributed with probability

$$p_i = \frac{\rho_i}{\rho_i + 1}$$

and p_i is beta distributed across stations as

$$p_i \sim Beta\left(\mu, \phi\right)$$

the expected catch at station i conditional on N_i is $E(N_{Bi}) = N_i\mu$ and the variance is

$$V(N_{Bi}) = N_i\mu(1-\mu)\frac{\phi + N_i}{\phi + 1}$$

(Appendix F.1). Here the target of estimation is the marginal calibration factor

$$\rho = \frac{\mu}{1-\mu}.$$

Incidentally, when p_i is beta distributed, ρ_i has a beta-prime distribution (also called the beta distribution of the second kind) (Stuart Ord 1994 and Johnson *et al.* 1995). There is no analytical solution for the maximum likelihood estimators of ρ and ϕ and we use numerical optimization methods.

2.2.6 Independent negative binomial MLE

Suppose that the densities for each tow at station i are equivalent in expectation, but independent so that D_{Ai} and D_{Bi} are independent realizations of the same gamma distribution (eq. 4) and given these densities the catches by each vessel are Poisson random variables, then the catches by the *Albatross IV* and *Henry B. Bigelow* are independent negative binomial random variables with mean and variance as in Section 2.2.3, but no covariance. This estimator may be appropriate if there is no evidence of correlation of the paired tows. The MLE for the calibration factor in this case is again the same as eq. 2 (see Appendix E), but the variance estimator will be different. In the data simulations below, we calculate the MLE and variance estimator using numerical optimization methods. Results pertaining to the variance estimator are of interest for this model.

2.2.7 Gamma MLE

If, conditional on the N_{vi} fish caught by vessel v at station i, the weight of each fish is an independent and identically distributed gamma random variable,

$$w_{vij} \sim Gamma(a_v, b_v)$$

where $E(w_{vij}) = a_v b_v$ (the mean weight of a fish) and $V(w_{vij}) = a_v b_v^2$. The sum of the weights of all fish (i.e., the total biomass) is also gamma distributed,

$$W_{vi} = \sum_{j=1}^{N_{vi}} w_{vij} \sim Gamma(N_{vi} a_v, b_v)$$

Because of the invariance property of MLEs, the MLE of the average fish weight for vessel v is $\hat{\mu}_{wv} = \hat{a}_v \hat{b}_v$.

The expected total biomass for vessel v can also be written as $E(W_{vi}) = E(N_{vi})E(w_{vij})$ as such, the ratio of catches in total biomasses is

$$\rho_W = \frac{E(W_{Bi})}{E(W_{Ai})} = \frac{E(N_{Bi})E(w_{Bij})}{E(N_{Ai})E(w_{Aij})} = \rho_N \rho_w, \tag{5}$$

so that the MLE of the total biomass calibration factor (ρ_W) is the product of the total number calibration factor and the ratio of the MLEs for average fish weight (i.e., the average weight calibration factor, ρ_w).

2.3 Data simulation

Our analyses began with simulation studies to evaluate the performance of the estimators under various assumptions about how the data from the paired tows arise.

2.3.1 Negative multinomial data

We generated negative multinomial data, using the assumptions described above in Section 2.2.3. First we generated densities of fish at each station, d_i from a gamma distribution,

$$d_i \sim Gamma\left(d, r\right).$$

Then, conditional on the densities at each station d_i, we generated the catch per tow for vessel v from a Poisson distribution,

$$N_{vi} \sim P\left(\mu_{vi}\right)$$

where $\mu_{vi} = q_v d_i$ is the mean catch conditional on the generated density d_i.

In simulations, we set $\mu_B = \rho\mu_A$ where $\rho = 1.5$. The value for the calibration factor we assumed was based on the expectation that the *Henry B. Bigelow* will catch more individuals for most species We assessed the statistical behavior of the estimators of ρ over ranges of μ_A, r and number of total stations S via probability of making inferences, bias and variance of the point estimator, and bias of the variance estimator. We used all combinations of the values in Table 1 in the simulation exercise. For each combination, we performed 1000 data simulations and made estimates and corresponding variance estimates in each simulation for all estimators.

2.3.2 Independent negative binomial data

Because there is a possibility that densities observed by the two vessels at each station are vastly different and perhaps uncorrelated, we also performed simulations where the densities are independent, but with the same mean. When the realized density at station i is different and independent for each tow, the data are independent, but still negative binomial with the above means and variances. We again used all combinations of the values in Table 1 in these simulations and assumed $\rho = 1.5$.

2.3.3 Beta-negative multinomial data

Upon review of the data collected from the calibration experiment, we found that there was substantially greater variance in the proportion of the catch by the *Henry B. Bigelow* than expected under the binomial model for all prevalent species. This can occur if there is variation in the catchabilities of each vessel and, consequently, calibration factors across stations. Variation in densities between hauls at a given station would also produce extra variability of the proportions caught by the *Henry B. Bigelow*, but if the densities are independent, there would be no correlation of the catches at each station. When we have a similar data generating mechanism as Section 2.3.1, but where the probability of capture by the *Henry B. Bigelow* varies from station to station according to the beta distribution,

$$p = \frac{\rho}{\rho+1} \sim Beta(\mu, \phi), \tag{5}$$

the marginal distribution of the catches by both vessels is a type of beta-negative multinomial distribution (see Appendix F). Conditioning on the total catch at each station, the catch by the *Henry B. Bigelow* has a beta-binomial distribution.

We performed simulation exercises where parameters of the data model were estimated from 22 species in the spring and fall surveys. All the species chosen for simulation had significant correlations between *Albatross IV* and *Henry B. Bigelow* catches and varying prevalence and calibration factor estimates (Table 2). As with the other simulation exercises, we performed 1000 simulations for each species catch characteristics, and made calculations for the previously described estimators. From the results we can determine how frequently across the various species the correct estimator (i.e., beta-binomial MLE) performs best with respect to statistical properties such as bias and variance of the estimator and bias of the variance estimator.

2.3.4 Over-dispersed beta-negative multinomial model

To observe any sensitivity of the beta-binomial MLE to greater than beta-binomial variability we performed simulations where the calibration factor has greater variability across stations. For the beta-negative multinomial model the probability of capture by the *Henry B. Bigelow* at station i was assumed to arise from a beta distribution (eq. 5). Here we assigned a prior distribution to μ that is also beta,

$$\mu \sim Beta(\mu^*, \phi_1).$$

As ϕ_1 increases, the distribution of the catches by the *Henry B. Bigelow* (conditional on the total) becomes beta-binomial, but as ϕ_1 approaches zero, there is ``extra" variability because

$$V(\mu) = \frac{\mu^*(1-\mu^*)}{\phi_1 + 1}.$$

We performed this exercise for a single species (Acadian redfish) and at various values of $\phi_1 \in \{10, 100, 1000, 10000, 100000\}$ and set μ^* to the value estimated from the calibration study data using a beta-binomial model.

2.4 Proposed estimates of calibration factors for counts

After assessing the statistical behavior of the estimators through simulation and discovering that there is much greater variability in the proportion caught by the *Henry B. Bigelow* than expected under binomial model through generalized Pearson χ^2 goodness-of-fit statistics,

$$\chi_p^2 = \sum \frac{[N_{Bi} - \widehat{E}(N_{Bi} \mid N_i)]^2}{\widehat{V}(N_{Bi} \mid N_i)} \tag{6}$$

(e.g., McCullagh and Nelder 1989, pg. 34), we determined that the best model-based approach to estimating the calibration factor for counts is to assume a beta-binomial model for the data generating mechanism. We evaluated goodness-of-fit of the beta-binomial models using likelihood ratio tests and(or) AIC$_c$ (Burnham and Anderson 2002).

Assuming the beta-binomial model is appropriate, we still must determine whether there is evidence of seasonal changes in the calibration factor or dispersion parameter or differences in those parameters between the standard survey stations and the non-random, site-specific stations. We fit a suite of models that allowed different parameters between standard and site-specific stations and that also allowed parameters to differ between the seasonal surveys (Table 3).

We estimated calibration factors and dispersion parameters in log-space. Variance estimates are obtained from inverting the hessian matrix for the log-likelihood, maximized with respect to the log-parameters. As such, variance (standard error) estimates for the exponentiated parameters are obtained via the delta method (Casella and Berger 2002). Asymmetric confidence intervals are calculated by exponentiating the confidence intervals for the log-parameters. Letting $\widehat{X} = \log(\widehat{\rho})$,

$$CI(\widehat{\rho}) = \exp\left[\widehat{X} \pm z_{1-\alpha/2} SE(\widehat{X})\right]$$

and $\alpha = 0.05$ in all analyses.

During *Henry B. Bigelow* trawl operations, data on the fishing behavior of the gear are collected. If certain tow parameters do not fall within an acceptable range, the station will be resampled. Nevertheless, these attributes may explain variability in the efficiency of the *Henry B. Bigelow* and ultimately the calibration factor and we might account for these attributes in comparing future tows to previous surveys conducted with the *Albatross IV*. To this end, we evaluated any association of the *Henry B. Bigelow* gear performance attributes that are collected for each tow with the calibration factor. Specifically, we fit beta-binomial generalized linear models with tow distance, net opening, door spread and wing spread of the *Henry B. Bigelow* as covariates for a subset of species that represent a range of behavior and body types.

2.5 Proposed estimates of calibration factors for total biomass

Our default methodology for estimating the total biomass calibration factor is to multiply calibration factors for counts and mean fish weight. We estimate mean fish weight for catches on either vessel assuming that the total biomass is gamma distributed (see Section 2.2.7). Similar to the counts-based calibration factor estimation, we also fit models where parameters differ depending on whether the stations are part of the spring or fall surveys or are part of the site-specific set, or that the also differ between seasonal surveys (Table 4).

3 Results

3.1 Data simulations

3.1.1 Negative multinomial model

When we simulated data assuming a negative multinomial model as the station data generating mechanism, the probability of estimating the calibration factor is nearly one at all but very low values of expected catch by the *Albatross IV* regardless of the dispersion parameter (Figure 1). Even when there are as few as 50 stations in the experiment, estimation is possible. Note that only results for the ratio and beta-binomial MLE are displayed because all of the other estimators have the same form as the ratio estimator.

Similarly, both the ratio estimator and the beta-binomial estimator approach unbiasedness rapidly as the expected catch by the *Albatross IV* increases (Figure 2). The decrease in bias is somewhat slower when there are fewer stations and there is greater dispersion (lower r) of the data. The variance (or coefficient of variation) of the estimators also decreases in the same manner (Figure 3).

When expected catches of the *Albatross IV* are very low, there is substantial bias of the variance estimators corresponding to different calibration factor estimators (Figure 4). The bias of the variance estimators decreases rapidly as the mean catches increase except for that of the independent negative binomial MLE. The bias of the variance estimator corresponding to the independent negative binomial MLE increases with mean catch by the *Albatross IV*. However, this bias decreases as the negative multinomial dispersion parameter (r) increases and there appears to be no trend with the number of stations. Again, note that the variance estimator for the binomial MLE, independent Poisson MLE, and negative multinomial MLE should be the same because the conditional binomial model will capture all of the statistical information for the calibration factor.

The coverage of constructed 95% confidence intervals is negatively biased (under coverage) at very low expected catches of the *Albatross IV* (Figure 5). For the independent negative binomial MLE in particular, there is noticable positive bias (over coverage) of the confidence intervals when the dispersion parameter r is small. The ratio estimator is negatively biased when the dispersion parameter and number of stations are small.

The general poor behavior of the different estimators at very low mean catches is expected because there there is little information. However, generally, the estimators all perform well as the mean catch, number of stations, and dispersion parameter increase. Note also that as the dispersion parameter increases, the data become independent and Poisson distributed.

3.1.2 Independent negative binomial data

When we have the same marginal distribution for the tows by the *Albatross IV* and *Henry B. Bigelow* and the tows are independent at each station, we observe the same increase in the probability of estimating the calibration factor with expected catch of the *Albatross IV* for either the ratio estimator or the beta-binomial MLE (Figure 6). Both estimators are substantially biased when the dispersion parameter and number of stations are small, but the beta-binomial MLE does not become unbiased as the mean catch nor the number of stations increases when the dispersion parameter is small (Figure 7). Both types of estimators become unbiased as the dispersion parameter increases.

As expected, the precision of the two types of estimators again increases as the mean catch, dispersion, and number of stations increase (Figure 8). However, the ratio estimators are more variable than the beta-binomial MLE when the dispersion parameter is small.

The variance estimator corresponding to the ratio estimator and beta-binomial and independent negative binomial MLEs are least biased over the ranges of dispersion and number of stations in the simulations (Figure 9). The variance estimators for the binomial MLE and quasi-likelihood estimators are substantially negatively biased at all but the largest values assumed for the dispersion parameter.

The bias of the beta-binomial MLE and the bias of the variance estimators for the binomial and quasi-likelihood estimators results in substantial under coverage of corresponding confidence intervals (Figure 10). However, the coverage for the beta-binomial MLE and quasi-likelihood estimator approaches unbiasedness more quickly than the binomial MLE as the dispersion parameter increases.

3.1.3 Species-specific beta-binomial model

As might be expected, the beta-binomial MLE performed best with respect to biases of the calibration factor and variance estimator, minimum variance, and confidence interval coverage for most species in either season (Tables 5 to 10). In the spring-based simulations, the beta-binomial MLE of the calibration factor had minimum bias and variance and the corresponding variance estimator had minimum bias for all species. For silver hake, scup, and windowpane, the independent negative binomial model had slightly less bias of the 95% confidence interval coverage, but the bias of the coverage using the beta-binomial model was negligible. Estimation was generally poor for Atlantic halibut, because so few fish were caught as exhibited by the mean catches of the *Albatross IV*.

In the fall-based simulations, the beta-binomial MLE of the calibration factor also had minimum bias and variance for all species. Only for Atlantic halibut was there less bias of an alternative variance estimator (for ratio estimator). For yellowtail flounder there was slightly less bias of the confidence interval coverage using the independent negative binomial model and the ratio estimator approach had slightly less bias of confidence interval coverage for goosefish. However, the bias of the coverage using the beta-binomial model was negligible in either case. Atlantic halibut and goosefish were the least prevalent of the 21 species in the fall.

3.1.4 Over-dispersed beta-negative multinomial model

When the variance structure of the data departs from that of the beta-binomial model, the statistical behavior of the beta-binomial MLE appeared acceptable. We simulated data using parameters estimated from the data on Acadian redfish from the calibration study, and the bias of the MLE and the corresponding variance estimator were negligible (Tables 11 and 12). At the lowest values of ϕ_1 the extra variability was largest and model departure was strongest, but there was no apparent trend of increased bias or poorer confidence interval coverage at these values.

3.2 Count-based calibration factors

During the calibration study, we observed catches by either the *Albatross IV* or *Henry B. Bigelow* for over 300 species or species groups (Table 13). The beta-binomial model makes use of data from any station where there was some catch, but the frequency of stations where there was some catch as well as the average number caught per station plays an important role in how strong the inferences are for the relative efficiency, or calibration factor, of a given species. For example, over all 636 stations, there were only two where sand tiger sharks were caught and at both of those stations only the *Albatross IV* caught them (SVSPP = 12, Table 14). This is an extreme case, but for species with low frequencies of occurrence and low numbers caught per tow, estimation is not likely possible and even when it is, the obtained estimates will likely be substantially biased. Similarly, the ability to make reliable estimates separately for the spring and fall survey will be hampered when there is low frequency of stations where a species is caught in one season. Because virtually no bluefish were caught during the spring portion of the calibration study (SVSPP = 135, Table 15), but were much more frequently caught during the fall, estimation of a spring-specific calibration factor will be difficult and estimation of a fall-specific calibration factor will likely be feasible. The total amount of information was increased for some species by the incorporation of site-specific stations and if the calibration factor is constant across station types, this will improve precision of the calibration factor estimator. For Atlantic cod, (SVSPP = 73), there were 41 stations where fish were caught during the spring, 46 where fish were caught in the fall and 82 where they were caught during the site-specific portion of the study. In this case, the precision of the calibration factor estimator across all stations is increased due to the site-specific stations. However, if there is evidence that the calibration factor is different for these stations, we must estimate separate calibration factors for different portions of the study.

The mean number caught will also affect the precision of the calibration factor estimates. For example, goosefish (SVSPP = 197) were caught at 294 of the 636 stations (Table 14), but the mean catch per station was less than one (Table 16). Mean catches with each type of station will also be important for precise estimates of calibration factors for different seasons of the survey or for site-specific stations (Tables 17 to 19).

We showed with the simulation exercises that even when the catch by the *Henry B. Bigelow* is binomial distributed (conditional on the total catch) a beta-binomial MLE still performs well, but the converse was not true. When we fit binomial models assuming a constant calibration factor across all stations, there were 96 species (groups) where, based on the Pearson χ^2 test, there was no statistical evidence that the binomial model was inadequate (Table 20). However, only five of these species groups were observed at 20 or more stations and they were all incompletely classified groups (e.g., Ling Unclassified., SVSPP = 87) except Atlantic angel shark (SVSPP = 16), cusk (SVSPP = 84), and Northern Puffer (SVSPP = 196). Further, species (groups) were adequately fit by the binomial model when calibration factors were assumed different for the survey and site-specific stations, and also assumed different for the fall and spring survey stations. Although, the binomial model may be appropriate for these species, the beta-binomial model will also give reliable results and is less restrictive in assumptions.

We can also see why the binomial is not an adequate fit for most species by observing how the proportions of catches by the *Henry B. Bigelow* at a station vary with respect to the total catch at the station (Figure 11). When there is binomial variability in the data, the variability in the proportion decreases rapidly as the total catch increases. For those species plotted and most other species observed in the calibration experiment, more than 5% of the points lie outside the range of proportions expected under the binomial model, particularly at larger total catches.

Another important determiner of whether we might use an estimator that assumes the catches at each station are independent and negative binomial distributed is whether the tows at each station are correlated. If the catches arise from a negative multinomial or beta-negative multinomial they are implicitly positively correlated. However, if the catches are independent, we saw that some estimators other than the independent negative binomial MLE, can give substantially biased inferences.

When measuring correlation via Kendall's τ test over all 636 stations, we found that, among species with enough information, paired tows were significantly positively correlated for all but 49 species or species groups (Table 16). Furthermore, there were fewer than 20 stations where individuals were observed for all but three of the 49 species, many of the species are actually incompletely classified species groups (e.g., Unclassified cancer crab), and none of the 49 species (groups) are of primary interest (i.e., commercially important). Note also that there was no significant negative correlation of the paired tows for any of the species (groups). Correlation tests were also performed for subsets of stations in the spring survey (Table 17), fall survey (Table 18), and the site-specific portion of the calibration study (Table 19). Among spring stations, Atlantic menhaden (SVSPP = 36) was the only species of primary interest not significantly correlated, but it was observed at only 4 stations. Among the fall survey stations, striped bass (SVSPP = 139) and Atlantic wolffish (SVSPP = 192) were the species of primary interest which were not significantly correlated, but these species were observed at only 5 and 6 stations, respectively. Finally, among stations in the site-specific portion of the calibration study, Atlantic halibut (SVSPP = 101) was the only species of primary interest that was not significantly correlated, but it was observed at only 5 stations.

We evaluate the goodness-of-fit of the beta-binomial models using likelihood ratio tests and AIC_c. Likelihood ratio tests require that models be nested so there is some limitation on which models can be tested. We perform six tests for each species (group) where the calibration factor or dispersion parameter differs (test statistics are in Table 21 and p-values are in Table 22). For example, there is no statistical evidence that calibration factors differ between survey and site-specific stations ($M_{1,1}$ to $M_{2,1}$, see Table 3 for model definitions), for Atlantic cod (SVSPP = 73), nor is there any evidence that there are differences in the dispersion parameter ϕ ($M_{1,1}$ to $M_{1,2}$) between the types of stations. In fact, there is no evidence of differences in either parameter between seasonal surveys. On the other hand, there is statistical evidence for different dispersion parameters in different seasons of the survey for winter skate (SVSPP = 23). In all, there was statistical evidence of differences in either the calibration factor or dispersion parameter between seasonal surveys or between survey and site-specific stations for 71 species (groups) that were encountered during the calibration study. Note that even though some tests were significant, it is important to take into consideration the number of stations where the species were observed.

When we use AIC adjusted for sample size (AIC_c), we can compare non-nested models, but the degree to which the AIC values must differ for one to consider one model or the other better is subjective. Also, the model determined best using the lowest AIC value may not correspond to the best model using a likelihood ratio test. However, the tests often agree. For example, the AIC values for the model fits for Atlantic cod (SVSPP = 73) (Table 23) indicate that the model with constant calibration factor and dispersion parameter is best, just as the likelihood ratio tests. Of the 188 species groups where it was possible to fit models and calculate AIC_c values, the simplest model was best for 111 of them.

The calibration factor MLEs for all beta-binomial models are presented in Tables 24 to 38. Where species in Table 13 are absent, there were insufficient observations or reliable estimation was not obtained. Estimates of calibration factors for site-specific stations under some models are not provided because of redundancy with other simpler models. For example, the calibration factors for site-specific stations under model $M_{3,1}$ are the same as those under model $M_{2,1}$.

3.2.1 Analyses of *Henry B. Bigelow* Gear Effects

In the analyses of associations of gear effects with the calibration factor, there was no evidence of association for most of the tow attributes across the species we investigated (Table 39). For Acadian redfish, Atlantic herring, and pollock there was a significant association with tow distance and for summer and yellowtail flounder there was a significant association with net opening. Note that there were 48 statistical test performed here and 5 ($\sim$ 10%) were significant.

3.3 Calibration factors for total biomass

As described in Sections 2.2.7 and 2.5, our methodology for estimating a calibration factor for total biomass was to multiply calibration factors for counts and mean fish weight. We used the beta-binomial MLEs for the calibration factor for counts and for the MLEs of the mean weight calibration factor we assumed the total biomass from a tow as a gamma random variable.

Ultimately, the best combination of models for the counts- and biomass-based calibration factors is determined using goodness-of-fit criteria and use the products of those estimators for that of the total biomass per tow. For example, if it is determined that the beta-binomial model with calibration factors differing by survey season and the gamma model for mean weight per fish with constant calibration factor are best, then the calibration factors for total biomass during the fall survey would use the product of the fall-specific counts-based calibration factor and the constant mean weight calibration factor.

Note that the ratio of mean fish weights will be the opposite of the ratio of expected catches in counts when one vessel catches more, but smaller fish than the other. In such cases, the calibration factor for total biomass per tow will be less than that for total count per tow. Whether we might expect this can be determined by looking at the arithmetic mean catches per vessel and mean fish weights per vessel (Tables 40 to 43). For example, the mean catch in biomass for Atlantic cod (SVSPP = 73) over 636 stations is higher for the *Henry B. Bigelow*, but the mean fish weight is higher for the *Albatross IV*. This is a common occurrence for the predominant species.

3.3.1 Gamma mean weight models

There is no evidence for parameters to differ between survey and site-specific stations or between fall and spring survey stations for 26 species (groups) including the rosette skate (SVSPP = 25) based on likelihood ratio tests (Tables 44 and 45). There is evidence for parameters to differ only between survey and site-specific stations for 16 species (groups) including smooth dogfish (SVSPP = 13), little and thorny skates (SVSPP = 26 and 28), white hake (SVSPP = 76) and Atlantic halibut (SVSPP = 101). There is evidence for parameters to also differ between fall and spring survey stations for 95 species (groups) including spiny dogfish (SVSPP = 15), several of the skates and flounders. Similar inferences can be drawn from AIC $_c$ values (Table 46).

The calibration factor MLEs from all gamma models are presented in Tables 47 to 51. Where species are absent, there were insufficient observations or reliable estimation was not obtained. Estimates of calibration factors for site-specific stations under some models are not provided because of redundancy with other simpler models.

4 Recommendations

During an 11-14 August 2009 meeting at the NEFSC, a panel of independent scientists (Panel) reviewed these analyses and made recommendations about when estimation of calibration factors should be performed and, if it is performed, what type of estimators to use. They suggested to not attempt estimation of calibration factors if there are less than 30 sets of paired tows where both the *Albatross IV* and *Henry B. Bigelow* caught some fish of a given species due to the resulting estimates being unreliable. They made the same recommendation for estimation of season-specific (i.e., spring or fall) calibration factors. When there are 30-50 sets of paired tows where both vessels had some catch, then they recommended using the estimate derived from the beta-binomial model if the estimate derived from the ratio estimator was either approximately equal or greater than the beta-binomial estimate. The Panel suggested that the estimates were approximately equal if the beta-binomial estimate was inside of the 95% confidence interval of the ratio estimate. This implies that they recommend to use the ratio estimate only if the beta-binomial estimate was greater than the upper end of the confidence interval of the ratio estimate. However, whatever estimator is chosen should be used with caution. This same recommendation applies for season-specific estimation. If there are greater than 50 sets of tows where both vessels had some catch (possibly by season), the same criterion for using either the ratio or beta-binomial estimators holds, but the Panel deemed the resulting estimates to be reliable.

It is important to note that the number of stations where a species was observed as well as the total number of individuals observed both provide statistical information to the estimation of the calibration factor for a given species. To avoid unreliable estimates, the Panel recommended to only use estimates for species with sufficient numbers of stations where it was observed by both vessels. However, this recommendation imperfectly protects against unreliable estimates because of the two sources of statistical information. Consider two extreme hypothetical example data situations. In the first, a species is observed by both vessels at only 25 stations, but there are greater than 1000 total fish caught at each station. In the second, another species is observed by both vessels at 35 stations, but no more than 10 total fish are observed at each station. Based on the Panel recommendations , estimation would not be advised in the former example, but would be in the latter although there is arguably more information in the former. The problem is further complicated by how variable the ratio is from station to station, but this attribute of information at multiple levels is common to any hierarchical random effects model.

The Panel did not make any recommendations on the efficacy of the approach we used to estimate biomass-based calibration factors, but we suggest using the their recommendations for determining a numbers-based estimator for the respective component of the biomass-based estimator (see eq. 5). The Panel recommendations on sufficient numbers of $+_A +_B$ stations for estimating mean weight calibration factors $\hat{\rho}_w$. That is, only use estimates for species with ≥ 30 $+_A +_B$ total stations and only use season-specific estimates when there are ≥ 30 $+_A +_B$ stations among each set of survey stations.

Only 47 species were observed by both vessels $\left(+_A +_B\right)$ at ≥ 30 stations and of those 19 were observed by both vessels at ≥ 30 stations during each of the fall and spring surveys (Table 52). Of the 28 species that only had sufficient numbers of $+_A +_B$ stations by combining both seasonal sets of survey stations, the ratio estimate is recommended only for scup (SVSPP = 143) (Table 53). Of the 19 species where there were sufficient $+_A +_B$ stations during each seasonal set of survey stations, the ratio estimate is recommended for little skate (SVSPP = 26), haddock (SVSPP = 74), and four-spot flounder (SVSPP = 104) in the spring (Table 54) and for winter skate (SVSPP = 23), spotted hake (SVSPP = 78), four-spot flounder (SVSPP = 104), windopane (SVSPP = 108), and longfin squid (SVSPP = 503) in the fall (Table 55).

The estimator for the biomass-based calibration factor in eq. 5 requires the estimators of both the numbers-based and mean weight calibration factors. For species that only had sufficient numbers of $+_A +_B$ stations by combining both seasonal sets of survey stations, the estimates of the mean weight calibration factor are obtained from fitting model M_1 where the gamma distribution is assumed (Table 48) which are multiplied with the numbers-based calibration factor estimates in Table 53 to obtain the biomass-based calibration factor estimates (Table 56). For species where there were sufficient $+_A +_B$ stations during each seasonal set of survey stations, the season-specific estimates of the mean weight calibration factor are obtained from fitting model M_3 where the gamma distribution is assumed (Tables 51 and 52). The season-specific mean weight calibration factor estimates are multiplied by the season-specific numbers-based calibration factor estimates in Tables 54 and 55 to obtain the season-specific estimates of the biomass-based calibration factor (Tables 57 and 58).

5 Discussion

When the catches are positively correlated, we found that the ratio estimator and the beta-binomial MLE both perform well. In the data we observed from the calibration experiment, there was significant and positive correlation of all species that were frequently caught. The negative multinomial or beta-negative multinomial models can account for this positive correlation and the beta-binomial MLE performs well when the data arise from either model. However, there was evidence of greater than binomial dispersion for virtually all species. The beta-binomial MLE or ratio or quasi-likelihood estimators would be preferred in this case to account for the variability. The Panel recommended the ratio estimator in certain circumstances, but there is no associated probability model. When the beta-binomial model is used, the calibration data can be incorporated into likelihood-based assessment models because there is an associated probability model.

Assessing goodness-of-fit with the Pearson χ^2 statistic should be considered qualitative. The use of the Pearson χ^2 statistic when parameters are estimated by maximum likelihood is not actually asymptotically χ^2 distributed with $n-p$ degrees of freedom (Chernoff and Lehmann 1954), and that of the generalized Pearson χ^2 statistic (eq. 6) is probably not either. However, the bias of the resulting inferences may not be badly biased and the Pearson goodness-of-fit tests are only one measure to guide us in determining whether a model is adequate. The likelihood ratio tests and AIC_c values will also inform on which model within a set is preferable.

Using the binomial or beta-binomial models for the counts-based calibration factor estimation is a natural way to use data where one of the tows at a given station catches zero individuals. However, it is important to emphasize that stations where no fish are caught with either vessel have no effect on estimation (see Appendix F). As such, we need not be concerned with constraining our inferences for a given species to data from the spatial ranges where they occur. Furthermore, our treatment of the calibration factor for total biomass as the product of factors for counts and weight per fish avoids having to deal with delta distributions for zero tows and continuous positive data. The expected catch in counts assigns probability to zero catches and as such averages over zero as well as positive tows.

Note that while we did explore potential effects of tow performance on the calibration factors, there is no accounting for differences between survey strata in our estimates. We may know that there are differences in expected catches and perhaps catchability across strata, but unless there are differences in the *ratio* of *Henry B. Bigelow* to *Albatross IV* catches across strata, inclusion of strata as a factor in the model will not affect the estimation of the calibration factor. Furthermore, with the few tows per stratum and even fewer informative observations for each species, we would generally have no power to detect stratum differences and would need many more observations per stratum to estimate the stratum effects.

Cadigan *et al.* (2006) and Cadigan and Dowden (2010) found generalized linear models with mixed effects (GLMMs) to adequately capture variation in the catchabilities across stations or the variability of fish densities between tows at a given station. Cadigan and Dowden (2010) suggest that when the two tows at a given station are independent negative binomial random variables where densities are independent gamma random variables and tows are independent Poisson random variables conditional on the densities, the binomial GLMM approach will work well in estimating calibration factors. The GLMM approach is analogous to the beta-binomial model for the calibration factor in that the beta distribution incorporated variability in the proportion caught by one of the two vessels just as the normal random effects in the GLMM do. We found that the beta-binomial MLE did not perform well with respect to bias and confidence interval coverage when we simulated independent negative binomial data with r less than 5 and mean catches per tow of the *Albatross IV* were less than 5 per tow even when the number of stations was as high as 250 ($\rho = 1.5$). However, the GLMM MLEs may in fact perform differently than the the beta-binomial MLEs.

Given that a beta-binomial model or a binomial GLMM could be used to estimate calibration factors, there are differences in the ease with which the two estimation approaches could be integrated with likelihood-based stock assessment methods that require the calibration factor estimates (and account for their uncertainty). There are a variety of fitting procedures for

GLMMs, but generally the marginal likelihood is not maximized because analytic integration is not possible. Cadigan and Dowden (2010) do obtain MLEs from the marginal model using SAS, but numerical methods are used to maximize the marginal likelihood. In contrast, the beta-binomial probability model can be easily coded in various software that have optimization capabilities such as AD Model Builder (ADMB 2009) and therefore can be combined with likelihoods for stock assessments that must make use of survey data.

The primary focus of this work was development of a rigorous procedure for estimating calibration factors for various assessed species. However, we have not addressed how the resulting estimates are applied. The calibration factor as parameterized here is the efficiency of the *Henry B. Bigelow* relative to that of the *Albatross IV*, but in the near-term, we will scale catches of the *Henry B. Bigelow* to the lengthy time series of *Albatross IV* data. As such, we will be interested in the inverse of the calibration factor as parameterized here. This requires a simple transformation. Because of the logit link we use here, all estimated parameters are in the log space of the calibration factor. So, that $\widehat{\rho} = \exp(\widehat{\theta})$ and the estimator of the inverse is $\widehat{\rho}^{*} = 1/\widehat{\rho} = \exp(-\widehat{\theta})$. By standard application of the delta-method, the corresponding standard error is

$$SE(\widehat{\rho}^{*}) = \frac{SE(\widehat{\rho})}{\widehat{\rho}^{2}}.$$

6 Future Work

Because the mean catches of the *Henry B. Bigelow* relative to those of the *Albatross IV* appear to depend on the size structure of the population being sampled for many species, calibration factors that are not a function of size may be unreliable when applied in the future to survey catches that sample different size structures due to a strong recruitment, rebuilding, or increased selective fishing pressure. For species where there is evidence of changes of the calibration factor with length, it would appear that application of length-specific calibration factors would be more appropriate than constant calibration factors. The Panel recommended estimation of length-based calibration factors when possible, but what complicates the matter is that the criterion the Panel advised for determining whether to use ratio or beta-binomial estimators does not seem to apply when length is incorporated. For some functional relationship of length and calibration factor, the recommendation to use the ratio estimator when the beta-binomial estimate is greater than ratio estimate may result in different estimators applied for certain length intervals of the same species. Furthermore, the ratio estimator is based on a linear relationship between the catches of the two vessels and it is unclear how to apply this when the functional relationship is non-linear. Preliminary work with beta-binomial models that incorporate length has been performed for a few species, but further analyses with a variety of functional forms for the relationship of length to the calibration factor is advised.

A difference in average weight per fish between the two vessels for a given species is likely due to differences in selectivity of the two vessels. An alternative approach from eq. 5 for biomass-based calibration is to use the numbers-based calibration with length incorporated along with a length-weight relationship. The estimated biomass index for the Bigelow based on the albatross data would be

$$\hat{W}_B = \sum_{l=1}^{L} \hat{\rho}_l \hat{N}_{Al} \hat{w}_l = \sum_{l=1}^{L} \hat{N}_{Bl} \hat{w}_l$$

where $\hat{N}_{Al}$ is the number in length class *l* per tow for the *Albatross IV,* $\hat{\rho}_l$ is the estimated calibration factor for length class *l*, and $\hat{w}_l$ is the estimated mean weight of a fish in length class *l* from the length-weight relationship.

There is also a need to develop a method for estimating calibration factors for species that did not have sufficient numbers of stations where both vessels had non-zero tows for estimation of calibration factors (as recommended by the review panel). A promising idea proposed by the review panel is to use Bayesian hierarchical models to estimate average and species-specific calibration factors for similar species.

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Appendix

A Independent Poisson MLE

When that catches of the *Albatross IV* and *Henry B. Bigelow* at each station are independent and Poisson distributed with means $q_A D_i = \mu_i$ and $\rho\mu_i$, the log-likelihood over all S stations is

$$l(\rho, q_A) = \log(q_A)\sum N_{Ai} + \sum \log(D_i) N_{Ai} - q_A \sum D_i - \sum \log(N_{Ai}!)$$
$$+ \log(q_A \rho)\sum N_{Bi} + \sum \log(D_i) N_{Bi} - q_A \rho \sum D_i - \sum \log(N_{Bi}!).$$

Setting the derivative with respect to $q_A = 0$,

$$\frac{\partial l}{\partial q_A} = \frac{\sum N_{Ai}}{q_A} - \sum D_i + \frac{\sum N_{Bi}}{q_A} - \rho \sum D_i = 0$$
$$\Rightarrow \hat{q}_A = \frac{\sum N_{Ai} + \sum N_{Bi}}{(1+\hat{\rho})\sum D_i}$$

and doing the same for ρ,

$$\frac{\partial l}{\partial \rho} = \frac{\sum N_{Bi}}{\rho} - q_A \sum D_i = 0$$
$$\Rightarrow \hat{q}_A = \frac{\sum N_{Bi}}{\hat{\rho}\sum D_i}$$

Setting the equations for $\hat{q}_A$ equal yields

$$\hat{\rho} = \frac{\sum_{i=1}^{S} N_{Bi}}{\sum_{i=1}^{S} N_{Ai}}.$$

B Conditional Distributions

When two random variables, X_i and X_j, are independent and Poisson distributed with means μ_i and μ_j, the distribution of either conditional on the total $X_i + X_j = X$ is binomial. This can be shown by factorization,

$$P(X_i = x_i, X_j = x_j) = \frac{e^{\mu_i}\mu_i^{x_i}}{x_i!}\frac{e^{\mu_j}\mu_j^{x_j}}{x_j!} = \underbrace{\frac{e^{\mu}\mu^{x}}{x!}}_{P(X=x)}\underbrace{\frac{x!}{x_i!x_j!}\left(\frac{\mu_i}{\mu}\right)^{x_i}\left(\frac{\mu_j}{\mu}\right)^{x_j}}_{P(X_i=x_i|X=x)}$$

where $x = x_i + x_j$, $\mu = \mu_i + \mu_j$ and the marginal distribution of the total, $P(X)$ is Poisson.

Similarly, when two random variables are jointly negative multinomial distributed, the conditional distribution is binomial,

$$P(X_i = x_i, X_j = x_j) = \frac{(r+x-1)!}{(r-1)!x_i!x_j!}\left(\frac{r}{r+\mu}\right)^{r}\left(\frac{\mu_i}{r+\mu}\right)^{x_i}\left(\frac{\mu_j}{r+\mu}\right)^{x_j}$$
$$= \underbrace{\frac{(r+x-1)!}{(r-1)!x!}\left(\frac{r}{r+\mu}\right)^{r}\left(\frac{\mu}{r+\mu}\right)^{x}}_{P(X=x)}\underbrace{\frac{x!}{x_i!x_j!}\left(\frac{\mu_i}{\mu}\right)^{x_i}\left(\frac{\mu_j}{\mu}\right)^{x_j}}_{P(X_i=x_i|X=x)} \tag{7}$$

where the marginal distribution of the total is negative binomial.

C Negative multinomial MLE

Assuming that $(N_{A1}, N_{B1}), \ldots, (N_{AS}, N_{BS})$ are independent negative multinomial random variables with probability function eq. 7, the log-likelihood over all S stations

$$l(\rho, mu_A) = Sr\log\left(\frac{r}{r+(1+\rho)\mu_A}\right) + \log\left(\frac{\mu_A}{r+(1+\rho)\mu_A}\right)\left(\sum N_{Ai} + \sum N_{Bi}\right) + \log(\rho)\sum N_{Bi}$$

Setting the derivative with respect to $\rho = 0$,

$$\frac{\partial l}{\partial \rho} = \frac{\sum N_{Bi}}{\rho} - \frac{\mu_A}{r+(1+\rho)\mu_A}(Sr + \sum N_{Ai} + \sum N_{Bi}) = 0$$

$$\Rightarrow \widehat{\rho} = \frac{(\widehat{r} + \widehat{\mu}_A)\sum N_{Bi}}{\widehat{\mu}_A(n\widehat{r} + \sum N_{Ai})}$$

and doing the same for μ_A,

$$\frac{\partial l}{\partial \mu_A} = \frac{\sum N_{Ai} + \sum N_{Bi}}{\mu_A} - \frac{(1+\rho)}{r+(1+\rho)\mu_A}(Sr + \sum N_{Ai} + \sum N_{Bi}) = 0$$

$$\Rightarrow \widehat{\mu}_A = \frac{\sum N_{Ai} + \sum N_{Bi}}{S(1+\widehat{\rho})}$$

and after substitution, we obtain $\widehat{\rho} = \sum N_{Bi} / \sum N_{Ai}$.

D Conditional Binomial MLE

Assuming that $N_{B1}, \ldots, N_{BS}$ are independent and binomial distributed $Bin(N_i, p)$, the MLE of p is

$$\widehat{p} = \frac{\sum_{i=1}^{S} N_{Bi}}{\sum_{i=1}^{S} N_i}$$

and of the calibration factor $\rho = p/(1-p)$ is

$$\widehat{\rho} = \frac{\widehat{p}}{1-\widehat{p}} = \frac{\sum_{i=1}^{S} N_{Bi}}{\sum_{i=1}^{S}(N_i - N_{Bi})} = \frac{\sum_{i=1}^{S} N_{Bi}}{\sum_{i=1}^{S} N_{Ai}}$$

because of the invariance property of MLEs (Casella and Berger 2002).

E Independent Negative Binomial MLE

When that catches of the *Albatross IV* and *Henry B. Bigelow* at each station are independent and

Poisson distributed with means $q_A D_{Ai} = \mu_i$ and $q_B D_{Bi} = \rho D_{Bi}$ and densities for each tow are independent and Gamma distributed $D_{vi} \sim Gamma(D,r)$, the catches are independent negative binomial random variables. The likelihood for data at station i is

$$P(N_{Ai}, N_{Bi}) = \binom{r+N_{Ai}-1}{N_{Ai}}\left(\frac{r}{r+\mu}\right)^r \left(\frac{\mu}{r+\mu}\right)^{N_{Ai}} \binom{r+N_{Bi}-1}{N_{Bi}}\left(\frac{r}{r+\rho\mu}\right)^r \left(\frac{\rho\mu}{r+\rho\mu}\right)^{N_{Bi}}$$

and the log-likelihood over all S stations is

$$l(\rho,\mu,r) = \sum \log\left(\binom{r+N_{Ai}-1}{N_{Ai}}\right) + \sum \log\left(\binom{r+N_{Bi}-1}{N_{Bi}}\right)$$
$$+S\left[\log\left(\frac{r}{r+\mu}\right) + \log\left(\frac{r}{r+\rho\mu}\right)\right] + \log\left(\frac{\mu}{r+\mu}\right)\sum N_{Ai} \log\left(\frac{\rho\mu}{r+\rho\mu}\right)\sum N_{Bi}.$$

Setting the derivative with respect to $\mu = 0$,

$$\frac{\partial l}{\partial \mu} = \frac{\sum N_{Ai} + \sum N_{Bi}}{\mu} - \frac{\sum N_{Ai} + rS}{r+\mu} - \rho \frac{rS + \sum N_{Bi}}{r+\rho\mu} = 0$$
$$\Rightarrow \hat{\mu} = \frac{\sum N_{Ai}}{S}$$

and doing the same for ρ,

$$\frac{\partial l}{\partial \rho} = \frac{\sum N_{Bi}}{\rho} - \mu \frac{rS + \sum N_{Bi}}{r+\rho\mu} = 0$$
$$\Rightarrow \hat{\rho} = \frac{\sum N_{Bi}}{S\hat{\mu}} = \frac{\sum N_{Bi}}{\sum N_{Ai}}$$

F A Beta-negative multinomial model

Assume two random variables (x_i, x_j) are jointly negative multinomially distributed,

$$P(X_i = x_i, X_j = x_j) = \frac{(r+x-1)!}{(r-1)!x_i!x_j!}\left(\frac{r}{r+\mu}\right)^r \left(\frac{\mu_i}{r+\mu}\right)^{x_i} \left(\frac{\mu_j}{r+\mu}\right)^{x_j}.$$

Let

$$p_r = \frac{r}{r+\mu},$$
$$p_i = \frac{\mu_i}{r+\mu} = (1-p_r)\pi_i,$$
$$p_j = \frac{\mu_j}{r+\mu} = (1-p_r)\pi_j = (1-p_r)(1-\pi_i)$$

where π_i is the probability of outcome i given outcomes i or j occur. Substituting,

$$P(X_i = x_i, X_j = x_j) = \frac{(r+x-1)!}{(r-1)!x_i!x_j!} p_r^r \left[(1-p_r)\pi_i\right]^{x_i} \left[(1-p_r)(1-\pi_i)\right]^{x_j}$$

Now if $\pi_i \sim Beta(a,b)$, the joint distribution of (x_i, x_j, π_i) is

$$\begin{aligned}
P(x_i, x_j, \pi_i) &= \frac{(r+x-1)!}{(r-1)!x_i!x_j!} p_r^r \left[(1-p_r)\pi_i\right]^{x_i} \left[(1-p_r)(1-\pi_i)\right]^{x_j} \frac{\pi_i^{a-1}(1-\pi_i)^{b-1}}{B(a,b)} \\
&= \frac{(r+x-1)!}{(r-1)!x_i!x_j!} p_r^r (1-p_r)^{x_i+x_j} \frac{\pi_i^{a+x_i-1}(1-\pi_i)^{b+x_j-1}}{B(a,b)} \\
&= \frac{(r+x-1)!}{(r-1)!x_i!x_j!} p_r^r (1-p_r)^{x_i+x_j} \frac{B(a+x_i, b+x_j)}{B(a,b)} \underbrace{\frac{\pi_i^{a+x_i-1}(1-\pi_i)^{b+x_j-1}}{B(a+x_i, b+x_j)}}_{\pi_i|x_i,x_j \sim Beta(a+x_i, b+x_j)}
\end{aligned}$$

After integrating out the random variable π_i, the marginal distribution of (x_i, x_j) is

$$\begin{aligned}
P(x_i, x_j) &= \frac{(r+x-1)!}{(r-1)!x_i!x_j!} p_r^r (1-p_r)^{x_i+x_j} \frac{B(a+x_i, b+x_j)}{B(a,b)} \\
&= \frac{\Gamma(r+x)}{\Gamma(r)\Gamma(x_i+1)\Gamma(x_j+1)} \frac{\Gamma(a+b)\Gamma(a+x_i)\Gamma(b+x_j)}{\Gamma(a)\Gamma(b)\Gamma(a+b+x_i+x_j)} p_r^r (1-p_r)^{x_i+x_j} \\
&= \underbrace{\frac{\Gamma(r+x)}{\Gamma(r)n!} p_r^r (1-p_r)^n}_{n \sim NegBin(r, p_r)} \underbrace{\frac{n!}{x_i!(n-x_i)!} \frac{B(a+x_i, b+n-x_i)}{B(a,b)}}_{x_i|n \sim BetaBin(n,a,b)}
\end{aligned}$$

where $n = x_i + x_j$ and we see that the conditional distribution of x_i given the total n is beta-binomially distributed. Notice that when $n = 0$,

$$P(x_i \mid n = 0) = \frac{0!}{0!0!} \frac{B(a,b)}{B(a,b)} = 1$$

so that the likelihood components of stations where both tows have no catches have no effect on the maximum likelihood estimator. Note also that when $n = x_i$,

$$P(x_i \mid n = x_i) = \frac{x_i!}{x_i!0!} \frac{B(a+x_i, b)}{B(a,b)} = \frac{B(a+x_i, b)}{B(a,b)}$$

which does vary with parameter values a, b so stations where only one tow is positive will have an effect on the maximum likelihood estimator.

F.1 Mean and variance of a beta-binomial random variable

When

$$p_i \sim Beta(\mu, \phi)$$

and

$$X_i \mid p_i, N_i \sim Bin(N_i, p_i)$$

The marginal expectation of X_i is

$$E(X_i \mid N_i) = E_p[E_X(X_i \mid N_i, p_i)] = E_p(N_i p_i) = N_i \mu$$

and the marginal variance is

$$
\begin{aligned}
V(X_i \mid N_i) &= V_p[E_X(X_i \mid N_i, p_i)] + E_p[V_X(X_i \mid N_i, p_i)] = V_p(N_i p_i) + E_p[N_i p_i(1-p_i)] \\
&= N_i^2 \frac{\mu(1-\mu)}{\phi+1} + N_i\mu - N_i \frac{\mu(1-\mu)}{\phi+1} - N_i\mu^2 \\
&= N_i\mu(1-\mu)\left[1+\frac{N_i-1}{\phi+1}\right]
\end{aligned}
$$

Table 1. Values of dispersion parameter (r), number of station (S), and mean catch by the *Albatross IV* (μ_A) used in negative multinomial and independent negative binomial simulation studies.

r	S	μ_A
0.1	50	0.005
0.5	75	0.050
1.0	100	0.250
5.0	150	0.500
10.0	200	2.500
100.0	250	5.000

Table 2. For each species, the seasonal beta-negative multinomial parameters used in simulations. Calibration factors (ρ) are given from fitting beta-binomial models whereas others are moment-based estimates from the data.

Species	$\mu_{s,A}$	ρ_s	r_s	ϕ_s	$\mu_{f,A}$	ρ_f	r_f	ϕ_f
Acadian Redfish	20.9632	1.2915	0.0136	1.2201	37.4143	1.4192	0.0457	2.4969
American Plaice	1.2947	2.0743	0.1409	1.5399	4.7291	2.1595	0.0413	2.8002
Atlantic Cod	1.0158	1.8236	0.0824	1.3401	0.4064	2.6798	0.0381	0.5757
Atlantic Halibut	0.0316	1.5001	0.0553	0.1021	0.0637	0.6418	0.0239	0.3584
Atlantic Herring	22.8263	2.2866	0.178	0.7277	9.2351	2.0007	0.0748	2.1295
Atlantic Mackerel	23.9368	1.3897	0.0165	0.6924	1.0478	1.7043	0.0765	0.1875
Black Sea Bass	0.3053	2.1231	0.0391	0.1208	1.5498	4.9769	0.0204	1.1444
Butterfish	73.9737	1.487	0.0172	1.1346	149.4661	1.935	0.0645	1.455
Goosefish	0.1316	9.1589	0.2819	0.5843	0.3147	6.3214	0.2505	1.9639
Haddock	16.0947	1.6241	0.0297	1.3051	9.2908	1.8157	0.0217	1.3391
Ocean Pout	0.4684	5.07	0.1517	0.4507	1.3068	3.6197	0.0125	0.6943
Pollock	0.4789	0.7153	0.0732	0.5468	0.2829	0.7938	0.0378	0.6944
Red Hake	5.4579	3.9591	0.1119	1.4205	6.0677	2.6615	0.1109	1.8878
Scup	5.0158	3.2815	0.048	0.4282	127.5498	2.8003	0.0603	2.3028
Silver Hake	22.4895	6.2826	0.0961	4.4796	28.1076	4.3549	0.2148	2.197
Spiny Dogfish	63.6053	1.2024	0.2269	2.3089	26.8884	1.204	0.0364	1.7292
Summer Flounder	0.7	3.2258	0.2895	1.6082	1.2351	2.4052	0.153	2.4288
White Hake	1.9158	2.4625	0.0319	1.1008	2.1594	2.153	0.1493	2.228
Windowpane	0.8421	3.3112	0.1527	1.7724	1.7928	2.6963	0.0588	1.7644
Winter Flounder	2.3053	2.6603	0.0407	0.8473	1.7649	2.6443	0.0429	1.8121
Witch Flounder	0.9526	2.7918	0.0839	2.2089	0.5657	3.2563	0.0924	2.8052
Yellowtail Flounder	3.6947	2.3472	0.0916	1.4951	5.8685	2.3663	0.0427	1.78

Table 3. Fitted beta-binomial models for counts.

Models	No. ρ parameters	No. ϕ parameters	Definitions
$M_{1,1}$	1	1	Constant ρ and ϕ
$M_{2,1}$	2	1	ρ differs by station type (Survey or Site-specific), ϕ is constant
$M_{1,2}$	1	2	ϕ differs by station type (Survey or Site-specific), ρ is constant
$M_{2,2}$	2	2	ρ and ϕ differ by station type (Survey or Site-specific)
$M_{3,1}$	3	1	ρ differs by station type and survey season, ϕ is constant
$M_{1,3}$	1	3	ϕ differs by station type and survey season, ρ is constant
$M_{3,2}$	3	2	ρ differs by station type and survey season, ϕ differs by station type
$M_{2,3}$	2	3	ϕ differs by station type and survey season, ρ differs by station type
$M_{3,3}$	3	3	ρ and ϕ differ by station type and survey season

Table 4. Fitted gamma models for mean fish weight.

Models	No. parameters	Definitions
M_1	4	Parameters differ by vessel
M_2	8	Parameters differ by vessel and station type
M_3	12	Parameters differ by vessel, station type, and season

Table 5. For each species and season (*s* or *f*), the biases of all ratio estimators (ρ_1) and the beta-binomial MLE (ρ_2).

Species	$\text{Bias}(\hat{\rho}_{s,1})$	$\text{Bias}(\hat{\rho}_{s,2})$	$\text{Bias}(\hat{\rho}_{f,1})$	$\text{Bias}(\hat{\rho}_{f,2})$
Acadian Redfish	0.0727	0.0233	0.0629	0.0157
American Plaice	0.0815	0.0244	0.0825	0.0255
Atlantic Cod	0.3217	0.0975	0.3197	0.103
Atlantic Halibut	$>10^4$	$>10^4$	0.3824	0.1736
Atlantic Herring	0.0405	0.0073	0.0516	0.0114
Atlantic Mackerel	0.1418	0.0238	0.1316	0.0411
Black Sea Bass	0.8593	0.2271	0.8245	0.1982
Butterfish	0.054	0.0068	0.084	0.0126
Goosefish	0.0727	0.0484	0.0615	0.0431
Haddock	0.218	0.0395	0.2688	0.0511
Ocean Pout	1.4768	0.4107	$>10^4$	$>10^4$
Pollock	0.1826	0.0877	0.1534	0.0697
Red Hake	0.0488	0.0137	0.03	0.008
Scup	0.0822	0.0165	0.0928	0.0136
Silver Hake	0.0456	0.0165	0.0451	0.0143
Spiny Dogfish	0.0975	0.0175	0.109	0.0177
Summer Flounder	0.0259	0.0116	0.031	0.0147
White Hake	0.0269	0.0166	0.0348	0.0176
Windowpane	0.0964	0.0385	0.0984	0.0391
Winter Flounder	0.1308	0.0543	0.1438	0.0653
Witch Flounder	0.063	0.0391	0.0503	0.0285
Yellowtail Flounder	0.1476	0.0434	0.1304	0.0303

Table 6. For each species and season (*s* or *f*), the variances of all ratio estimators (ρ_1) and the beta-binomial MLE (ρ_2).

Species	$V(\hat{\rho}_{s,1})$	$V(\hat{\rho}_{s,2})$	$V(\hat{\rho}_{f,1})$	$V(\hat{\rho}_{f,2})$
Acadian Redfish	0.2456	0.0431	0.2479	0.0443
American Plaice	0.6908	0.1572	0.7903	0.1516
Atlantic Cod	7.1679	1.5182	6.8862	1.4713
Atlantic Halibut			1.0722	0.3736
Atlantic Herring	0.3672	0.0757	0.3888	0.0892
Atlantic Mackerel	0.997	0.1911	1.0473	0.2424

Black Sea Bass	163.4615	16.9755	130.7198	13.9961
Butterfish	0.5395	0.0707	0.6133	0.0703
Goosefish	3.8436	2.2388	3.678	2.435
Haddock	2.1952	0.2472	2.6182	0.2364
Ocean Pout	615.7584	384.2595		
Pollock	0.4119	0.1643	0.3146	0.112
Red Hake	0.5863	0.1516	0.5201	0.1425
Scup	1.006	0.1495	1.0193	0.1476
Silver Hake	1.0644	0.2555	0.9608	0.2419
Spiny Dogfish	0.3038	0.0434	1.2118	0.1775
Summer Flounder	0.2534	0.1278	0.3097	0.1458
White Hake	0.2394	0.0943	0.2347	0.0938
Windowpane	1.2326	0.3569	1.2709	0.3281
Winter Flounder	1.8283	0.4633	1.6913	0.4311
Witch Flounder	0.9585	0.4937	0.8296	0.4435
Yellowtail Flounder	1.3484	0.256	1.3092	0.2486

Table 7. For each species, the bias of variance estimators for the ratio estimator (ρ_1), binomial MLE (ρ_2), quasi-likelihood estimator (ρ_3), beta-binomial MLE (ρ_4), and independent negative binomial MLE (ρ_5) in spring-based simulations.

Species	Bias$\left[\hat{V}(\hat{\rho}_1)\right]$	Bias$\left[\hat{V}(\hat{\rho}_2)\right]$	Bias$\left[\hat{V}(\hat{\rho}_3)\right]$	Bias$\left[\hat{V}(\hat{\rho}_4)\right]$	Bias$\left[\hat{V}(\hat{\rho}_5)\right]$
Acadian Redfish	-0.0272	-0.245	-0.2029	-0.0016	0.2269
American Plaice	-0.1249	-0.6811	-0.5362	-0.0029	0.5908
Atlantic Cod	-2.1047	-6.5056	-2.9847	-0.0802	-0.7357
Atlantic Halibut					
Atlantic Herring	-0.0427	-0.3637	-0.2868	0.0065	0.1861
Atlantic Mackerel	-0.114	-0.9557	-0.6051	0.0164	-0.0888
Black Sea Bass	-71.2842	-151.664	64.6317	-2.7723	-32.5204
Butterfish	-0.0994	-0.5393	-0.4571	-0.0038	0.0479
Goosefish	-0.4865	-2.9496	-1.7467	-0.0554	-0.9534
Haddock	-0.5965	-2.1857	-1.612	-0.0171	0.7658
Ocean Pout	-215.138	-324.377	169.6793	-130.738	390.9883
Pollock	-0.1077	-0.3507	-0.2189	-0.0383	0.0395
Red Hake	-0.0763	-0.5777	-0.4408	-0.007	0.1257
Scup	-0.1676	-1.0055	-0.8453	-0.0116	0.3905
Silver Hake	-0.1643	-1.0601	-0.814	-0.0142	-0.054
Spiny Dogfish	-0.0503	-0.3031	-0.25	0.0002	0.1781
Summer Flounder	0.0111	-0.2221	-0.1401	0.007	0.1673
White Hake	-0.0217	-0.2243	-0.1599	-0.0016	0.0975
Windowpane	-0.1979	-1.193	-0.8686	-0.0236	0.3806
Winter Flounder	-0.3999	-1.7774	-1.3019	-0.0476	0.5278
Witch Flounder	-0.0882	-0.8161	-0.5354	-0.0132	0.4827
Yellowtail Flounder	-0.2162	-1.3361	-1.0259	-0.0184	0.5071

Table 8. For each species, the bias of variance estimators for the ratio estimator (ρ_1), binomial MLE (ρ_2), quasi-likelihood estimator (ρ_3), beta-binomial MLE (ρ_4), and independent negative binomial MLE (ρ_5) in fall-based simulations.

Species	$\text{Bias}\left[\hat{V}(\hat{\rho}_1)\right]$	$\text{Bias}\left[\hat{V}(\hat{\rho}_2)\right]$	$\text{Bias}\left[\hat{V}(\hat{\rho}_3)\right]$	$\text{Bias}\left[\hat{V}(\hat{\rho}_4)\right]$	$\text{Bias}\left[\hat{V}(\hat{\rho}_5)\right]$
Acadian Redfish	-0.0459	-0.2474	-0.2067	-0.004	0.2108
American Plaice	-0.2067	-0.7804	-0.6267	0.0035	0.5145
Atlantic Cod	-1.9914	-6.2291	-2.8297	0.0294	-0.6313
Atlantic Halibut	0.1844	-0.396	0.632	0.2081	0.6606
Atlantic Herring	-0.065	-0.3851	-0.3052	-0.0061	0.1797
Atlantic Mackerel	-0.1692	-1.0064	-0.6519	-0.0198	-0.1451
Black Sea Bass	-53.6051	-121.47	13.2424	-1.7477	-25.0105
Butterfish	-0.1289	-0.6131	-0.5232	-0.0025	0.0441
Goosefish	-0.4666	-2.8123	-1.6878	-0.2734	-0.876
Haddock	-0.7463	-2.6076	-1.9441	-0.0042	0.6473
Ocean Pout					
Pollock	-0.0364	-0.2688	-0.148	-0.0007	0.0987
Red Hake	-0.0322	-0.5119	-0.3835	-0.0001	0.1609
Scup	-0.1275	-1.0188	-0.853	-0.0114	0.337
Silver Hake	-0.0792	-0.9566	-0.7154	-0.0021	0.0487
Spiny Dogfish	-0.1888	-1.2088	-0.9607	-0.0028	0.1275
Summer Flounder	-0.0336	-0.277	-0.1909	-0.0074	0.124
White Hake	-0.0136	-0.2194	-0.1536	-0.0003	0.1078
Windowpane	-0.2131	-1.2301	-0.8936	0.0084	0.3746
Winter Flounder	-0.2839	-1.642	-1.1738	-0.0126	0.6725
Witch Flounder	-0.0168	-0.696	-0.4336	0.0157	0.5507
Yellowtail Flounder	-0.2481	-1.2983	-1.0139	-0.0197	0.4783

Table 9. For each species, the 95% confidence interval coverage for the ratio estimator (ρ_1), binomial MLE (ρ_2), quasi-likelihood estimator (ρ_3), beta-binomial MLE (ρ_4), and independent negative binomial MLE (ρ_5) in spring-based simulations.

Species	CI Coverage$(\hat{\rho}_1)$	CI Coverage$(\hat{\rho}_2)$	CI Coverage$(\hat{\rho}_3)$	CI Coverage$(\hat{\rho}_4)$	CI Coverage$(\hat{\rho}_5)$
Acadian Redfish	0.897	0.075	0.572	0.94	0.972
American Plaice	0.871	0.193	0.611	0.938	0.976
Atlantic Cod	0.881	0.309	0.795	0.933	0.912
Atlantic Halibut	0.837	0.732	0.84	0.89	0.854
Atlantic Herring	0.899	0.152	0.632	0.961	0.973
Atlantic Mackerel	0.913	0.278	0.781	0.944	0.926
Black Sea Bass	0.862	0.123	0.769	0.938	0.915
Butterfish	0.878	0.043	0.522	0.94	0.935
Goosefish	0.924	0.642	0.86	0.945	0.921
Haddock	0.841	0.079	0.608	0.935	0.932
Ocean Pout	0.818	0.113	0.727	0.921	0.882
Pollock	0.869	0.501	0.811	0.929	0.914
Red Hake	0.932	0.177	0.642	0.948	0.963
Scup	0.898	0.029	0.529	0.935	0.945
Silver Hake	0.935	0.092	0.66	0.937	0.954
Spiny Dogfish	0.863	0.075	0.571	0.952	0.963
Summer Flounder	0.937	0.503	0.806	0.954	0.977
White Hake	0.921	0.383	0.742	0.945	0.975
Windowpane	0.896	0.246	0.693	0.935	0.946
Winter Flounder	0.893	0.212	0.688	0.948	0.958
Witch Flounder	0.916	0.513	0.811	0.941	0.964
Yellowtail Flounder	0.904	0.113	0.613	0.952	0.969

Table 10. For each species, the 95% confidence interval coverage for for the ratio estimator (ρ_1), binomial MLE (ρ_2), quasi-likelihood estimator (ρ_3), beta-binomial MLE (ρ_4), and independent negative binomial MLE (ρ_5) in fall-based simulations.

Species	CI Coverage$(\hat{\rho}_1)$	CI Coverage$(\hat{\rho}_2)$	CI Coverage$(\hat{\rho}_3)$	CI Coverage$(\hat{\rho}_4)$	CI Coverage$(\hat{\rho}_5)$
Acadian Redfish	0.884	0.078	0.564	0.935	0.965
American Plaice	0.86	0.14	0.606	0.948	0.967
Atlantic Cod	0.891	0.349	0.795	0.944	0.917
Atlantic Halibut	0.801	0.715	0.798	0.859	0.824
Atlantic Herring	0.912	0.137	0.634	0.936	0.969
Atlantic Mackerel	0.912	0.272	0.782	0.947	0.919
Black Sea Bass	0.867	0.11	0.773	0.938	0.922
Butterfish	0.887	0.033	0.542	0.948	0.944
Goosefish	0.933	0.653	0.846	0.927	0.917
Haddock	0.853	0.076	0.601	0.948	0.932
Ocean Pout	0.813	0.106	0.745	0.935	0.9
Pollock	0.859	0.504	0.798	0.917	0.897
Red Hake	0.914	0.196	0.672	0.951	0.961
Scup	0.9	0.031	0.543	0.944	0.931
Silver Hake	0.927	0.108	0.675	0.953	0.953
Spiny Dogfish	0.904	0.09	0.58	0.95	0.943
Summer Flounder	0.919	0.488	0.784	0.947	0.971
White Hake	0.929	0.387	0.752	0.948	0.973
Windowpane	0.894	0.247	0.728	0.952	0.956
Winter Flounder	0.906	0.236	0.708	0.954	0.959
Witch Flounder	0.934	0.522	0.824	0.949	0.978
Yellowtail Flounder	0.892	0.154	0.617	0.937	0.96

Table 11. Relative bias and variance of the beta-binomial MLE and expected value of the variance estimator and coverage of constructed confidence intervals at a range of "extra" dispersion ϕ_1 (see Section 2.3.4). Assumed calibration factor is estimated from spring survey calibration data for Acadian Redfish.

ϕ_1	Relative Bias$\left(\hat{\rho}\right)$	$V\left(\hat{\rho}\right)$	$E\left[\hat{V}\left(\hat{\rho}\right)\right]$	CI Coverage$\left(\hat{\rho}\right)$
10	0.018	0.056	0.050	0.927
100	0.016	0.041	0.042	0.947
1000	0.010	0.039	0.040	0.944
10000	0.003	0.038	0.039	0.954
100000	0.011	0.041	0.040	0.948

Table 12. Relative bias and variance of the beta-binomial MLE and expected value of the variance estimator and coverage of constructed confidence intervals at a range of "extra" dispersion ϕ_1 (see Section 2.3.4). Assumed calibration factor is estimated from fall survey calibration data for Acadian Redfish.

ϕ_1	Relative Bias$\left(\hat{\rho}\right)$	$V\left(\hat{\rho}\right)$	$E\left[\hat{V}\left(\hat{\rho}\right)\right]$	CI Coverage$\left(\hat{\rho}\right)$
10	0.019	0.046	0.051	0.961
100	0.014	0.042	0.042	0.946
1000	0.016	0.040	0.041	0.953
10000	0.015	0.041	0.040	0.945
100000	0.010	0.040	0.040	0.943

Table 13. Species observed during the calibration experiment.

Scientific Name	Common Name	SVSPP
Sebastes fasciatus	Acadian Redfish	155
Alectis ciliaris	African Pompano	568
Alosa pseudoharengus	Alewife	33
Aspidophoroides monopterygius	Alligatorfish	165
Anguilla rostrata	American Eel	384
Homarus americanus	American Lobster	301
Hippoglossoides platessoides	American Plaice	102
Alosa sapidissima	American Shad	35
Peristedion miniatum	Armored Searobin	173
Squatina dumeril	Atlantic Angel Shark	16
Argentina silus	Atlantic Argentine	46
Dibranchus atlanticus	Atlantic Batfish	199

Lolliguncula brevis	Atlantic Brief Squid	504
Chloroscombrus chrysurus	Atlantic Bumper	573
Gadus morhua	Atlantic Cod	73
Micropogonias undulatus	Atlantic Croaker	136
Trichiurus lepturus	Atlantic Cutlassfish	126
Cypselurus melanurus	Atlantic Flyingfish	465
Myxine glutinosa	Atlantic Hagfish	1
Hippoglossus hippoglossus	Atlantic Halibut	101
Clupea harengus	Atlantic Herring	32
Scomber scombrus	Atlantic Mackerel	121
Brevoortia tyrannus	Atlantic Menhaden	36
Porichthys plectrodon	Atlantic Midshipman	444
Selene setapinnis	Atlantic Moonfish	132
Strongylura marina	Atlantic Needlefish	471
Cancer irroratus	Atlantic Rock Crab	313
Scomberesox saurus	Atlantic Saury	205
Liparis atlanticus	Atlantic Seasnail	170
Rhizoprionodon terraenovae	Atlantic Sharpnose Shark	360
Menidia menidia	Atlantic Silverside	113
Melanostigma atlanticum	Atlantic Soft Pout	262
Chaetodipterus faber	Atlantic Spadefish	659
Acipenser oxyrhynchus	Atlantic Sturgeon	380
Opisthonema oglinum	Atlantic Thread Herring	428
Torpedo nobiliana	Atlantic Torpedo	21
Anarhichas lupus	Atlantic Wolffish	192
Diodon holocanthus	Balloonfish	849
Larimus fasciatus	Banded Drum	651
Seriola zonata	Banded Rudderfish	204
Ophidion holbrooki	Bank Cusk-eel	459
Centropristis ocyurus	Bank Sea Bass	526
Scorpaena brasiliensis	Barbfish	754
Dipturus laevis	Barndoor Skate	22
Paralepidae	Barracudina Unclassified	896
Ogcocephalidae	Batfish Unclassified	452
Bathynectes longispina	Bathyal Swimming Crab	517
Anchoa mitchilli	Bay Anchovy	43
Polymixia lowei	Beardfish	263
Priacanthus arenatus	Bigeye	134
Cubiceps pauciradiatus	Bigeye Cigarfish	876
Selar crumenophthalmus	Bigeye Scad	209
Centroscyllium fabricii	Black Dogfish	7
Centropristis striata	Black Sea Bass	141
Helicolenus dactylopterus	Blackbelly Rosefish	156
Synagrops bellus	Blackmouth Bass	114
Prionotus rubio	Blackwing Searobin	768
Ophidion grayi	Blotched Cusk-eel	458

Portunus spinimanus	Blotched Swimming Crab	516
Callinectes sapidus	Blue Crab	314
Caranx crysos	Blue Runner	129
Alosa aestivalis	Blueback Herring	34
Pomatomus saltatrix	Bluefish	135
Caulolatilus microps	Blueline Tilefish	621
Fistularia tabacaria	Bluespotted Cornetfish	120
Prionotus roseus	Bluespotted Searobin	766
Sphoeroides pachygaster	Blunthead Puffer	880
Dasyatis say	Bluntnose Stingray	18
Stomias boa	Boa Dragonfish	228
Sepiolidae	Bobtail Unclassified	506
Sphyrna tiburo	Bonnethead Shark	364
Calappidae	Box Crab Unclassified	339
Sicyonia brevirostris	Brown Rock Shrimp	316
Zenopsis conchifera	Buckler Dory	112
Cookeolus japonicus	Bulleye	616
Myliobatis freminvillei	Bullnose Ray	19
Peprilus triacanthus	Butterfish	131
Hepatus epheliticus	Calico Box Crab	327
Cancridae	Cancer Crab Unclassified	311
Scyliorhinus retifer	Chain Dogfish	14
Scomber japonicus	Chub Mackerel	124
Raja eglanteria	Clearnose Skate	24
Ovalipes stephensoni	Coarsehand Lady Crab	321
Rachycentron canadum	Cobia	563
Octopus vulgaris	Common Octopus	511
Promethichthys prometheus	Conejo	127
Conger oceanicus	Conger Eel	63
Congridae	Conger Eel Unclassified	390
Fistularia sp	Cornetfish Unclassified	490
Rhinoptera bonasus	Cownose Ray	270
Caranx hippos	Crevalle Jack	570
Tautogolabrus adspersus	Cunner	176
Brosme brosme	Cusk	84
Ophidiidae	Cusk-eel Unclassified	461
Lumpenus maculatus	Daubed Shanny	183
Antigonia capros	Deepbody Boarfish	158
Aluterus heudeloti	Dotterel Filefish	830
Sciaenidae	Drum Unclassified	858
Syacium papillosum	Dusky Flounder	793
Carcharhinus obscurus	Dusky Shark	3
Upeneus parvus	Dwarf Goatfish	657
Anguilliformes	Eel Unclassified	60
Etropus sp	Etropus Unclassified	794
Lepophidium profundorum	Fawn Cusk-eel	194

Trachinotus carolinus	Florida Pompano	579
Dactylopterus volitans	Flying Gurnard	175
Enchelyopus cimbrius	Fourbeard Rockling	83
Paralichthys oblongus	Fourspot Flounder	104
Mycteroperca microlepis	Gag	541
Galatheidae	Galatheid Unclassified	319
Acanthocarpus alexandri	Gladiator Box Crab	604
Priacanthus cruentatus	Glasseye Snapper	556
Gobiidae	Goby Unclassified	739
Lophius americanus	Goosefish	197
Etropus rimosus	Gray Flounder	786
Balistes capriscus	Gray Triggerfish	202
Seriola dumerili	Greater Amberjack	203
Reinhardtius hippoglossoides	Greenland Halibut	99
Macrouridae	Grenadier Unclassified	90
Myoxocephalus aenaeus	Grubby	166
Citharichthys arctifrons	Gulf Stream Flounder	109
Melanogrammus aeglefinus	Haddock	74
Peprilus alepidotus	Harvestfish	749
Sternoptychidae	Hatchetfish Unclassified	252
Clupeidae	Herring Unclassified	30
Trinectes maculatus	Hogchoker	118
Artediellus sp	Hookear Sculpin Unclassified	159
Bellator militaris	Horned Searobin	762
Citharichthys cornutus	Horned Whiff	780
Limulus polyphemus	Horseshoe Crab	318
Synodus foetens	Inshore Lizardfish	435
Equetus lanceolatus	Jackknife-fish	648
Cancer borealis	Jonah Crab	312
Synagrops spinosus	Keelcheek Bass	137
Scomberomorus cavalla	King Mackerel	744
Ovalipes ocellatus	Lady Crab	322
Kathetostoma albigutta	Lancer Stargazer	726
Myctophidae	Lanternfish Unclassified	56
Bothidae	Lefteye Flounder Unclassified	795
Prionotus scitulus	Leopard Searobin	769
Hippocampus erectus	Lined Seahorse	492
Urophycis sp	Ling Unclassified	87
Leucoraja erinacea	Little Skate	26
Synodontidae	Lizardfish Unclassified	852
Caretta caretta	Loggerhead Seaturtle	950
Urophycis chesteri	Longfin Hake	79
Loligo pealeii	Longfin Squid	503
Myoxocephalus octodecemspinosus	Longhorn Sculpin	163
Ogcocephalus corniger	Longnose Batfish	206
Parasudis truculenta	Longnose Greeneye	242

Pontinus longispinis	Longspine Scorpionfish	154
Macrorhamphosus scolopax	Longspine Snipefish	111
Selene vomer	Lookdown	133
Cyclopterus lumpus	Lumpfish	168
Cyclopteridae	Lumpfish Snailfish Unclassified	249
Scombridae	Mackerel And Tuna Unclassified	860
Decapterus macarellus	Mackerel Scad	208
Stomatopoda	Mantis Shrimp Unclassified	323
Sphoeroides dorsalis	Marbled Puffer	843
Ophichthus cruentifer	Margined Snake Eel	65
Nezumia bairdi	Marlin-spike	91
Gerreidae	Mojarra Unclassified	625
Ophidion selenops	Mooneye Cusk-eel	869
Muraenidae	Moray Unclassified	388
Lepophidium jeannae	Mottled Cusk-eel	457
Triglops murrayi	Moustache Sculpin	161
Epinephelus striatus	Nassau Grouper	538
Menticirrhus saxatilis	Northern Kingfish	146
Syngnathus fuscus	Northern Pipefish	116
Sphoeroides maculatus	Northern Puffer	196
Ammodytes dubius	Northern Sand Lance	181
Prionotus carolinus	Northern Searobin	171
Sphyraena borealis	Northern Sennet	694
Illex illecebrosus	Northern Shortfin Squid	502
Astroscopus guttatus	Northern Stargazer	179
Lithodes maja	Northern Stone Crab	324
Macrozoarces americanus	Ocean Pout	193
Octopoda	Octopus Unclassified	510
Merluccius albidus	Offshore Hake	69
Synodus poeyi	Offshore Lizardfish	437
Aluterus schoepfi	Orange Filefish	832
Ophichthus puncticeps	Palespotted Eel	396
Halieutichthys aculeatus	Pancake Batfish	449
Carapus bermudensis	Pearlfish	462
Orthopristis chrysoptera	Pigfish	142
Lagodon rhomboides	Pinfish	640
Syngnathidae	Pipefish Seahorse Unclassified	421
Monacanthus hispidus	Planehead Filefish	201
Otophidium omostigmum	Polka-dot Cusk-eel	186
Pollachius virens	Pollock	75
Tetraodontidae	Puffer Unclassified	861
Ulvaria subbifurcata	Radiated Shanny	184
Fistularia petimba	Red Cornetfish	489
Geryon quinquedens	Red Deepsea Crab	310
Sciaenops ocellatus	Red Drum	654
Mullus auratus	Red Goatfish	187

Urophycis chuss	Red Hake	77
Synodus synodus	Red Lizardfish	438
Chaunax stigmaeus	Redeye Gaper	862
Remora remora	Remora	567
Scyllarides nodifer	Ridged Slipper Lobster	302
Pleuronectidae	Righteye Flounder Unclassified	773
Pholis gunnellus	Rock Gunnel	180
Centropristis philadelphica	Rock Sea Bass	527
Leucoraja garmani	Rosette Skate	25
Trachurus lathami	Rough Scad	212
Ogcocephalus parvus	Roughback Batfish	451
Dasyatis centroura	Roughtail Stingray	4
Etrumeus teres	Round Herring	31
Decapterus punctatus	Round Scad	211
Pleoticus robustus	Royal Red Shrimp	910
Abralia veranyi	Ruppell’s Abralia	509
Serranus notospilus	Saddle Bass	551
Diplectrum formosum	Sand Perch	530
Carcharias taurus	Sand Tiger	12
Carcharhinus plumbeus	Sandbar Shark	9
Scorpaenidae	Scorpionfish And Rockfish Unclassified	759
Aluterus scriptus	Scrawled Filefish	833
Cottidae	Sculpin Unclassified	160
Stenotomus chrysops	Scup	143
Petromyzon marinus	Sea Lamprey	2
Hemitripterus americanus	Sea Raven	164
Placopecten magellanicus	Sea Scallop	401
Triglidae	Searobin Unclassified	174
Echeneis naucrates	Sharksucker	564
Archosargus probatocephalus	Sheepshead	631
Stoloteuthis leucoptera	Shield Bobtail	508
Pristigenys alta	Short Bigeye	557
Bellator brachychir	Shortfin Searobin	760
Chlorophthalmus agassizi	Shortnose Greeneye	232
Penaeus sp	Shrimp (pink,brown,white)	307
Crustacea shrimp	Shrimp Unclassified	305
Engraulis eurystole	Silver Anchovy	865
Merluccius bilinearis	Silver Hake	72
Eucinostomus gula	Silver Jenny	599
Bairdiella chrysoura	Silver Perch	148
Ariomma bondi	Silver Rag	213
Cynoscion nothus	Silver Seatrout	646
Hyporhamphus unifasciatus	Silverstripe Halfbeak	66
Benthodesmus simonyi	Simonys Frostfish	239
Antennarius radiosus	Singlespot Frogfish	446

Peristedion gracile	Slender Searobin	763
Nemichthys scolopaceus	Slender Snipe Eel	67
Etropus microstomus	Smallmouth Flounder	117
Gymnura micrura	Smooth Butterfly Ray	376
Mustelus canis	Smooth Dogfish	13
Lagocephalus laevigatus	Smooth Puffer	195
Malacoraja senta	Smooth Skate	27
Ophichthidae	Snake Eel Unclassified	425
Trachinocephalus myops	Snakefish	439
Chionoecetes opilio	Snow Crab	325
Myliobatis goodei	Southern Eagle Ray	378
Paralichthys lethostigma	Southern Flounder	789
Menticirrhus americanus	Southern Kingfish	652
Dasyatis americana	Southern Stingray	29
Scomberomorus maculatus	Spanish Mackerel	745
Sardinella aurita	Spanish Sardine	429
Majidae	Spider Crab Unclassified	317
Gymnura altavela	Spiny Butterfly Ray	375
Squalus acanthias	Spiny Dogfish	15
Prionotus alatus	Spiny Searobin	764
Bathypolypus arcticus	Spoonarm Octopus	512
Leiostomus xanthurus	Spot	149
Foetorepus agassizi	Spotfin Dragonet	735
Urophycis regia	Spotted Hake	78
Xenolepidichthys dalgleishi	Spotted Tinselfish	617
Cephalopoda	Squid, Cuttlefish, And Octopod Unclassified	501
Uranoscopidae	Stargazer Unclassified	857
Hemanthias aureorubens	Streamer Bass	546
Bellator egretta	Streamer Searobin	761
Argentina striata	Striated Argentine	856
Anchoa hepsetus	Striped Anchovy	44
Morone saxatilis	Striped Bass	139
Chilomycterus schoepfi	Striped Burrfish	198
Ophidion marginatum	Striped Cusk-eel	188
Haemulon striatum	Striped Grunt	878
Prionotus evolans	Striped Searobin	172
Paralichthys dentatus	Summer Flounder	103
Portunidae	Swimming Crab Unclassified	320
Xiphias gladius	Swordfish	700
Serranus phoebe	Tattler	552
Tautoga onitis	Tautog	177
Amblyraja radiata	Thorny Skate	28
Gasterosteus aculeatus	Threespine Stickleback	115
Lopholatilus chamaeleonticeps	Tilefish	151
Haemulon aurolineatum	Tomtate	627

Symphurus sp	Tonguefish Unclassified	221
Balistidae	Triggerfish Filefish Unclassified	820
Bothus robinsi	Twospot Flounder	873
Rhomboplites aurorubens	Vermilion Snapper	596
Chauliodus sloani	Viperfish	240
Cynoscion regalis	Weakfish	145
Maurolicus weitzmani	Weitzmans Pearlsides	229
Citharichthys sp	Whiff Unclassified	866
Arctozenus rissoi	White Barracudina	246
Urophycis tenuis	White Hake	76
Scophthalmus aquosus	Windowpane	108
Pseudopleuronectes americanus	Winter Flounder	106
Leucoraja ocellata	Winter Skate	23
Glyptocephalus cynoglossus	Witch Flounder	107
Lycenchelys verrilli	Wolf Eelpout	190
Cryptacanthodes maculatus	Wrymouth	191
Limanda ferruginea	Yellowtail Flounder	105

Table 14. For each species, the numbers of total stations where both vessels had catches $\left(+_A +_B\right)$, only the Albatross had catch $\left(+_A 0_B\right)$, only the Bigelow had catch $\left(0_A +_B\right)$, and neither vessel had catch $\left(0_A 0_B\right)$.

SVSPP	$+_A +_B$	$+_A 0_B$	$0_A +_B$	$0_A 0_B$
1	10	20	26	580
2	0	0	1	635
3	0	0	4	632
4	10	4	11	611
7	0	1	0	635
9	0	4	3	629
12	0	2	0	634
13	56	15	25	540
14	17	5	22	592
15	342	39	52	203
16	10	4	10	612
18	12	7	8	609
19	14	5	5	612
21	0	6	4	626
22	56	13	101	466
23	177	11	104	344
24	48	2	52	534
25	12	2	19	603
26	252	3	137	244

27	50	6	75	505
28	49	5	61	521
29	2	6	0	628
30	0	4	0	632
31	33	7	19	577
32	198	32	76	330
33	93	34	43	466
34	49	30	37	520
35	25	20	47	544
36	2	5	11	618
43	21	29	5	581
44	22	11	17	586
46	1	6	12	617
56	20	10	6	600
60	0	10	2	624
63	0	1	0	635
65	0	3	0	633
66	0	1	0	635
67	0	0	1	635
69	7	1	4	624
72	407	11	81	137
73	94	20	55	467
74	160	20	27	429
75	29	29	15	563
76	128	16	56	436
77	283	18	95	240
78	161	13	92	370
79	6	4	18	608
83	13	8	50	565
84	4	5	15	612
87	0	10	10	616
90	1	4	14	617
91	2	0	5	629
99	1	2	5	628
101	5	10	7	614
102	152	12	45	427
103	146	13	53	424
104	192	10	112	322
105	143	14	46	433
106	131	15	38	452
107	78	7	92	459
108	108	7	82	439
109	106	6	122	402
111	0	2	2	632
112	9	1	6	620
113	2	3	1	630

114	1	6	0	629
115	1	2	0	633
116	0	2	2	632
117	13	11	31	581
118	0	0	1	635
120	0	0	2	634
121	61	34	42	499
124	1	3	5	627
126	2	3	9	622
127	0	1	1	634
129	13	7	8	608
131	278	31	78	249
132	7	12	17	600
133	0	0	3	633
134	0	1	0	635
135	53	20	24	539
136	42	5	6	583
137	0	2	1	633
139	6	13	9	608
141	45	20	63	508
142	5	4	8	619
143	104	9	39	484
145	37	8	11	580
146	5	5	15	611
148	2	0	2	632
149	47	3	8	578
151	1	1	4	630
154	0	1	1	634
155	117	8	18	493
156	27	10	28	571
158	4	0	8	624
159	3	2	10	621
160	0	1	2	633
161	15	4	14	603
163	167	5	61	403
164	96	41	84	415
165	16	8	38	574
166	0	0	8	628
168	4	6	22	604
170	0	9	2	625
171	82	12	90	452
172	29	6	31	570
173	4	3	12	617
174	1	6	17	612
175	0	0	2	634
176	7	5	11	613

177	1	3	3	629
179	1	6	7	622
180	0	3	1	632
181	40	66	32	498
183	0	4	0	632
184	0	2	1	633
186	1	0	1	634
187	1	0	4	631
188	3	2	14	617
190	0	1	1	634
191	1	5	13	617
192	3	2	14	617
193	100	21	125	390
194	28	6	12	590
195	0	0	1	635
196	11	1	22	602
197	76	9	209	342
198	2	4	6	624
199	0	0	1	635
201	3	10	6	617
202	0	3	11	622
203	0	2	0	634
204	0	4	6	626
205	0	1	14	621
206	0	0	1	635
208	0	1	2	633
209	11	6	8	611
211	10	11	12	603
212	12	20	13	591
213	0	1	2	633
221	2	15	12	607
228	0	0	1	635
229	6	11	9	610
232	7	3	4	622
239	0	0	2	634
240	0	1	0	635
242	1	4	2	629
246	0	0	2	634
249	0	0	1	635
252	1	1	1	633
262	1	4	0	631
263	1	3	8	624
270	2	5	1	628
301	116	49	94	377
302	2	0	0	634
305	0	0	1	635

307	16	5	27	588
310	3	2	11	620
311	0	2	5	629
312	29	31	87	489
313	87	28	91	430
314	0	2	10	624
316	4	2	14	616
317	5	17	40	574
318	10	6	31	589
319	10	3	13	610
320	9	2	25	600
321	3	8	12	613
322	14	6	35	581
323	0	1	9	626
324	4	5	10	617
325	0	2	8	626
327	0	1	0	635
339	0	1	1	634
360	9	9	0	618
364	0	0	1	635
375	10	4	6	616
376	7	1	4	624
378	0	0	2	634
380	0	2	1	633
384	0	0	1	635
388	0	0	2	634
390	4	6	21	605
396	0	0	2	634
401	204	12	99	321
421	0	8	22	606
425	0	3	3	630
428	13	0	18	605
429	6	3	7	620
435	16	3	18	599
437	0	2	0	634
438	0	1	0	635
439	7	1	2	626
444	1	0	1	634
446	0	0	1	635
449	1	1	1	633
451	0	1	2	633
452	0	0	5	631
457	0	0	2	634
458	0	1	1	634
459	0	2	1	633
461	0	5	3	628

462	0	1	0	635
465	2	0	0	634
471	0	0	2	634
489	2	4	10	620
490	0	1	3	632
492	0	1	0	635
501	1	6	5	624
502	195	39	98	304
503	346	13	63	214
504	3	2	3	628
506	14	5	58	559
508	0	0	1	635
509	0	0	5	631
510	0	0	3	633
511	0	0	2	634
512	34	14	58	530
516	0	1	1	634
517	0	1	3	632
526	0	0	1	635
527	0	0	1	635
530	1	0	3	632
538	0	0	1	635
541	0	0	2	634
546	0	0	2	634
551	0	0	1	635
552	0	1	1	634
556	0	1	0	635
557	0	1	0	635
563	1	2	1	632
564	0	0	1	635
567	0	3	2	631
568	0	2	1	633
570	1	2	2	631
573	2	1	3	630
579	0	1	0	635
596	0	2	1	633
599	0	5	0	631
604	2	2	2	630
616	0	1	2	633
617	0	0	1	635
621	0	0	1	635
625	0	1	1	634
627	0	4	0	632
631	0	1	3	632
640	10	11	0	615
646	0	4	0	632

648	0	0	1	635
651	13	6	2	615
652	18	3	11	604
654	0	1	0	635
657	0	2	7	627
659	3	4	1	628
694	4	5	9	618
700	0	1	0	635
726	1	0	1	634
735	1	2	5	628
739	0	3	0	633
744	0	3	0	633
745	7	2	7	620
749	0	0	1	635
754	0	1	1	634
759	2	7	8	619
760	0	0	1	635
761	0	0	2	634
762	0	2	0	634
763	0	0	2	634
764	0	1	3	632
766	0	1	0	635
768	0	2	2	632
769	0	2	0	634
773	0	1	5	630
780	0	1	0	635
786	0	1	0	635
789	0	0	1	635
793	4	1	7	624
794	0	1	0	635
795	4	12	22	598
820	2	1	8	625
830	0	0	3	633
832	0	2	0	634
833	0	2	0	634
843	0	2	0	634
849	0	0	1	635
852	1	3	4	628
856	0	1	1	634
857	0	0	2	634
858	0	0	1	635
860	0	0	1	635
861	0	0	2	634
862	0	0	1	635
865	1	7	1	627
866	0	2	2	632

869	0	1	0	635
873	0	0	1	635
876	0	0	3	633
878	0	0	1	635
880	0	0	1	635
896	3	4	0	629
910	1	0	2	633
950	1	0	3	632

Table 15. For each species, the numbers of stations where both vessels had catches $\left(+_A +_B\right)$, only the Albatross had catch $\left(+_A 0_B\right)$, only the Bigelow had catch $\left(0_A +_B\right)$, and neither vessel had catch $\left(0_A 0_B\right)$ among the spring and fall survey and site-specific stations.

	Spring				Fall				Site-Specific			
SVSPP	$+_A +_B$	$+_A 0_B$	$0_A +_B$	$0_A 0_B$	$+_A +_B$	$+_A 0_B$	$0_A +_B$	$0_A 0_B$	$+_A +_B$	$+_A 0_B$	$0_A +_B$	$0_A 0_B$
1	1	2	6	181	4	11	9	227	5	7	11	172
2	0	0	1	189	0	0	0	251	0	0	0	195
3	0	0	4	186	0	0	0	251	0	0	0	195
4	3	1	1	185	7	3	10	231	0	0	0	195
7	0	0	0	190	0	1	0	250	0	0	0	195
9	0	0	2	188	0	4	1	246	0	0	0	195
12	0	2	0	188	0	0	0	251	0	0	0	195
13	11	1	8	170	32	10	12	197	13	4	5	173
14	6	1	12	171	6	4	8	233	5	0	2	188
15	113	18	15	44	85	15	18	133	144	6	19	26
16	5	1	4	180	5	3	6	237	0	0	0	195
18	0	3	1	186	12	4	7	228	0	0	0	195
19	1	0	0	189	13	5	5	228	0	0	0	195
21	0	1	2	187	0	1	2	248	0	4	0	191
22	11	5	16	158	20	7	37	187	25	1	48	121
23	50	5	47	88	53	2	19	177	74	4	38	79
24	21	1	24	144	27	0	28	196	0	1	0	194
25	3	1	10	176	9	1	9	232	0	0	0	195
26	76	2	44	68	81	0	52	118	95	1	41	58
27	12	3	13	162	13	2	31	205	25	1	31	138
28	10	2	12	166	9	2	24	216	30	1	25	139
29	2	2	0	186	0	4	0	247	0	0	0	195

30	0	1	0	189	0	0	0	251	0	3	0	192
31	2	1	0	187	30	6	19	196	1	0	0	194
32	69	11	34	76	54	3	14	180	75	18	28	74
33	48	10	12	120	20	1	6	224	25	23	25	122
34	31	8	18	133	5	3	4	239	13	19	15	148
35	12	7	16	155	7	2	7	235	6	11	24	154
36	0	2	2	186	2	2	9	238	0	1	0	194
43	8	7	0	175	13	14	4	220	0	8	1	186
44	0	4	0	186	22	7	17	205	0	0	0	195
46	0	6	3	181	1	0	7	243	0	0	2	193
56	6	4	3	177	13	1	3	234	1	5	0	189
60	0	8	0	182	0	0	1	250	0	2	1	192
63	0	1	0	189	0	0	0	251	0	0	0	195
65	0	0	0	190	0	3	0	248	0	0	0	195
66	0	0	0	190	0	1	0	250	0	0	0	195
67	0	0	0	190	0	0	1	250	0	0	0	195
69	2	0	1	187	5	1	3	242	0	0	0	195
72	99	1	36	54	140	7	33	71	168	3	12	12
73	27	3	16	144	22	7	12	210	45	10	27	113
74	33	7	8	142	42	6	12	191	85	7	7	96
75	8	6	1	175	11	8	3	229	10	15	11	159
76	26	4	10	150	55	3	24	169	47	9	22	117
77	62	6	37	85	101	7	21	122	120	5	37	33
78	59	2	34	95	73	3	39	136	29	8	19	139
79	3	0	3	184	2	4	9	236	1	0	6	188
83	6	2	8	174	2	4	20	225	5	2	22	166
84	1	1	4	184	2	3	4	242	1	1	7	186
87	0	2	0	188	0	6	7	238	0	2	3	190
90	1	1	9	179	0	3	5	243	0	0	0	195
91	0	0	0	190	2	0	5	244	0	0	0	195
99	1	0	4	185	0	2	1	248	0	0	0	195

101	2	3	3	182	3	4	2	242	0	3	2	190
102	31	5	19	135	45	3	15	188	76	4	11	104
103	51	5	23	111	63	4	8	176	32	4	22	137
104	45	3	24	118	77	4	52	118	70	3	36	86
105	39	4	19	128	38	5	10	198	66	5	17	107
106	23	4	12	151	49	3	11	188	59	8	15	113
107	28	1	29	132	31	1	21	198	19	5	42	129
108	43	4	29	114	44	2	36	169	21	1	17	156
109	29	3	43	115	34	3	38	176	43	0	41	111
111	0	0	1	189	0	2	1	248	0	0	0	195
112	2	0	0	188	6	0	6	239	1	1	0	193
113	2	2	1	185	0	0	0	251	0	1	0	194
114	1	0	0	189	0	6	0	245	0	0	0	195
115	0	0	0	190	1	2	0	248	0	0	0	195
116	0	0	2	188	0	0	0	251	0	2	0	193
117	10	7	14	159	2	3	15	231	1	1	2	191
118	0	0	1	189	0	0	0	251	0	0	0	195
120	0	0	1	189	0	0	1	250	0	0	0	195
121	34	12	10	134	11	8	21	211	16	14	11	154
124	0	0	0	190	1	3	5	242	0	0	0	195
126	2	0	1	187	0	3	8	240	0	0	0	195
127	0	0	1	189	0	1	0	250	0	0	0	195
129	0	0	0	190	13	7	8	223	0	0	0	195
131	54	11	15	110	149	9	39	54	75	11	24	85
132	0	0	0	190	7	12	15	217	0	0	2	193
133	0	0	0	190	0	0	3	248	0	0	0	195
134	0	0	0	190	0	1	0	250	0	0	0	195
135	2	1	3	184	46	12	16	177	5	7	5	178
136	5	4	0	181	37	1	6	207	0	0	0	195
137	0	0	0	190	0	2	1	248	0	0	0	195
139	4	3	3	180	0	2	3	246	2	8	3	182

141	7	9	18	156	23	2	24	202	15	9	21	150
142	0	1	1	188	5	3	7	236	0	0	0	195
143	13	3	12	162	59	2	11	179	32	4	16	143
145	6	1	3	180	31	7	8	205	0	0	0	195
146	0	4	2	184	5	1	13	232	0	0	0	195
148	2	0	1	187	0	0	1	250	0	0	0	195
149	5	2	2	181	42	1	6	202	0	0	0	195
151	0	0	0	190	0	1	1	249	1	0	3	191
154	0	1	1	188	0	0	0	251	0	0	0	195
155	20	3	4	163	50	2	5	194	47	3	9	136
156	16	3	11	160	7	4	13	227	4	3	4	184
158	2	0	3	185	2	0	3	246	0	0	2	193
159	0	0	0	190	2	2	5	242	1	0	5	189
160	0	1	2	187	0	0	0	251	0	0	0	195
161	3	2	3	182	6	1	3	241	6	1	8	180
163	48	0	14	128	41	3	22	185	78	2	25	90
164	28	9	20	133	30	11	25	185	38	21	39	97
165	1	6	3	180	8	0	6	237	7	2	29	157
166	0	0	0	190	0	0	8	243	0	0	0	195
168	0	0	5	185	4	3	14	230	0	3	3	189
170	0	0	2	188	0	9	0	242	0	0	0	195
171	23	1	38	128	30	9	25	187	29	2	27	137
172	8	2	9	171	16	2	18	215	5	2	4	184
173	4	1	5	180	0	2	6	243	0	0	1	194
174	1	4	1	184	0	2	16	233	0	0	0	195
175	0	0	0	190	0	0	2	249	0	0	0	195
176	0	0	3	187	5	0	6	240	2	5	2	186
177	0	0	1	189	1	0	2	248	0	3	0	192
179	0	0	2	188	1	6	5	239	0	0	0	195
180	0	1	0	189	0	1	1	249	0	1	0	194
181	10	24	5	151	10	14	7	220	20	28	20	127

183	0	0	0	190	0	3	0	248	0	1	0	194
184	0	1	0	189	0	1	1	249	0	0	0	195
186	0	0	0	190	1	0	1	249	0	0	0	195
187	0	0	0	190	1	0	4	246	0	0	0	195
188	0	1	1	188	3	1	13	234	0	0	0	195
190	0	1	0	189	0	0	0	251	0	0	1	194
191	0	1	7	182	1	1	5	244	0	3	1	191
192	0	0	1	189	0	2	4	245	3	0	9	183
193	32	7	32	119	23	6	34	188	45	8	59	83
194	7	2	5	176	14	1	6	230	7	3	1	184
195	0	0	0	190	0	0	1	250	0	0	0	195
196	1	1	3	185	9	0	18	224	1	0	1	193
197	17	3	48	122	35	2	79	135	24	4	82	85
198	0	0	0	190	2	4	6	239	0	0	0	195
199	0	0	1	189	0	0	0	251	0	0	0	195
201	0	1	1	188	3	9	5	234	0	0	0	195
202	0	1	0	189	0	2	11	238	0	0	0	195
203	0	0	0	190	0	2	0	249	0	0	0	195
204	0	0	0	190	0	4	6	241	0	0	0	195
205	0	0	0	190	0	1	10	240	0	0	4	191
206	0	0	1	189	0	0	0	251	0	0	0	195
208	0	0	1	189	0	1	1	249	0	0	0	195
209	0	0	0	190	11	6	8	226	0	0	0	195
211	0	1	0	189	10	7	12	222	0	3	0	192
212	0	7	0	183	12	4	13	222	0	9	0	186
213	0	0	0	190	0	1	2	248	0	0	0	195
221	1	8	3	178	1	7	9	234	0	0	0	195
228	0	0	0	190	0	0	1	250	0	0	0	195
229	0	3	1	186	2	4	0	245	4	4	8	179
232	3	1	0	186	4	2	4	241	0	0	0	195
239	0	0	2	188	0	0	0	251	0	0	0	195

240	0	0	0	190	0	1	0	250	0	0	0	195
242	1	2	1	186	0	2	0	249	0	0	1	194
246	0	0	0	190	0	0	2	249	0	0	0	195
249	0	0	0	190	0	0	0	251	0	0	1	194
252	0	0	0	190	1	1	1	248	0	0	0	195
262	0	1	0	189	1	3	0	247	0	0	0	195
263	0	2	2	186	1	1	6	243	0	0	0	195
270	0	0	0	190	2	5	1	243	0	0	0	195
301	32	7	22	129	57	15	33	146	27	27	39	102
302	0	0	0	190	2	0	0	249	0	0	0	195
305	0	0	0	190	0	0	1	250	0	0	0	195
307	7	3	6	174	9	2	21	219	0	0	0	195
310	1	1	3	185	2	1	5	243	0	0	3	192
311	0	0	4	186	0	2	1	248	0	0	0	195
312	1	10	17	162	21	14	42	174	7	7	28	153
313	34	13	29	114	39	12	34	166	14	3	28	150
314	0	0	0	190	0	2	10	239	0	0	0	195
316	2	0	2	186	2	2	11	236	0	0	1	194
317	1	7	15	167	4	3	22	222	0	7	3	185
318	6	2	15	167	4	4	16	227	0	0	0	195
319	7	1	4	178	3	2	5	241	0	0	4	191
320	0	2	14	174	9	0	10	232	0	0	1	194
321	0	3	4	183	3	5	8	235	0	0	0	195
322	0	3	6	181	14	3	29	205	0	0	0	195
323	0	0	1	189	0	1	8	242	0	0	0	195
324	0	1	0	189	3	1	4	243	1	3	6	185
325	0	0	2	188	0	2	5	244	0	0	1	194
327	0	1	0	189	0	0	0	251	0	0	0	195
339	0	1	1	188	0	0	0	251	0	0	0	195
360	0	2	0	188	9	7	0	235	0	0	0	195
364	0	0	0	190	0	0	1	250	0	0	0	195

375	2	2	1	185	8	2	5	236	0	0	0	195
376	1	0	0	189	6	1	4	240	0	0	0	195
378	0	0	2	188	0	0	0	251	0	0	0	195
380	0	1	1	188	0	0	0	251	0	1	0	194
384	0	0	1	189	0	0	0	251	0	0	0	195
388	0	0	1	189	0	0	1	250	0	0	0	195
390	0	1	6	183	4	5	5	237	0	0	10	185
396	0	0	0	190	0	0	2	249	0	0	0	195
401	52	3	37	98	80	6	25	140	72	3	37	83
421	0	4	5	181	0	4	17	230	0	0	0	195
425	0	2	1	187	0	1	2	248	0	0	0	195
428	0	0	0	190	13	0	18	220	0	0	0	195
429	0	0	0	190	6	3	7	235	0	0	0	195
435	3	2	2	183	13	0	16	222	0	1	0	194
437	0	1	0	189	0	1	0	250	0	0	0	195
438	0	1	0	189	0	0	0	251	0	0	0	195
439	2	0	0	188	5	1	2	243	0	0	0	195
444	0	0	0	190	1	0	1	249	0	0	0	195
446	0	0	1	189	0	0	0	251	0	0	0	195
449	1	0	1	188	0	1	0	250	0	0	0	195
451	0	0	2	188	0	1	0	250	0	0	0	195
452	0	0	0	190	0	0	4	247	0	0	1	194
457	0	0	1	189	0	0	1	250	0	0	0	195
458	0	0	0	190	0	1	1	249	0	0	0	195
459	0	0	1	189	0	2	0	249	0	0	0	195
461	0	1	1	188	0	4	2	245	0	0	0	195
462	0	0	0	190	0	1	0	250	0	0	0	195
465	0	0	0	190	2	0	0	249	0	0	0	195
471	0	0	0	190	0	0	2	249	0	0	0	195
489	1	2	0	187	1	2	10	238	0	0	0	195
490	0	0	1	189	0	1	2	248	0	0	0	195

492	0	0	0	190	0	1	0	250	0	0	0	195
501	0	2	0	188	1	4	5	241	0	0	0	195
502	19	2	14	155	93	18	41	99	83	19	43	50
503	74	1	21	94	165	6	19	61	107	6	23	59
504	2	1	0	187	1	1	3	246	0	0	0	195
506	13	1	23	153	1	0	18	232	0	4	17	174
508	0	0	0	190	0	0	1	250	0	0	0	195
509	0	0	2	188	0	0	3	248	0	0	0	195
510	0	0	2	188	0	0	1	250	0	0	0	195
511	0	0	0	190	0	0	1	250	0	0	1	194
512	13	3	5	169	19	5	23	204	2	6	30	157
516	0	1	1	188	0	0	0	251	0	0	0	195
517	0	1	0	189	0	0	0	251	0	0	3	192
526	0	0	0	190	0	0	1	250	0	0	0	195
527	0	0	1	189	0	0	0	251	0	0	0	195
530	1	0	0	189	0	0	3	248	0	0	0	195
538	0	0	0	190	0	0	1	250	0	0	0	195
541	0	0	0	190	0	0	2	249	0	0	0	195
546	0	0	0	190	0	0	2	249	0	0	0	195
551	0	0	1	189	0	0	0	251	0	0	0	195
552	0	0	0	190	0	1	1	249	0	0	0	195
556	0	0	0	190	0	1	0	250	0	0	0	195
557	0	0	0	190	0	1	0	250	0	0	0	195
563	0	0	0	190	1	2	1	247	0	0	0	195
564	0	0	1	189	0	0	0	251	0	0	0	195
567	0	0	0	190	0	3	2	246	0	0	0	195
568	0	0	0	190	0	2	1	248	0	0	0	195
570	0	0	0	190	1	2	2	246	0	0	0	195
573	0	0	0	190	2	1	3	245	0	0	0	195
579	0	0	0	190	0	1	0	250	0	0	0	195
596	0	0	1	189	0	2	0	249	0	0	0	195

599	0	0	0	190	0	5	0	246	0	0	0	195
604	0	0	1	189	0	1	0	250	2	1	1	191
616	0	0	0	190	0	0	2	249	0	1	0	194
617	0	0	0	190	0	0	1	250	0	0	0	195
621	0	0	1	189	0	0	0	251	0	0	0	195
625	0	0	0	190	0	1	1	249	0	0	0	195
627	0	0	0	190	0	4	0	247	0	0	0	195
631	0	1	2	187	0	0	1	250	0	0	0	195
640	1	1	0	188	9	10	0	232	0	0	0	195
646	0	0	0	190	0	4	0	247	0	0	0	195
648	0	0	0	190	0	0	1	250	0	0	0	195
651	1	2	0	187	12	4	2	233	0	0	0	195
652	3	2	2	183	15	1	9	226	0	0	0	195
654	0	0	0	190	0	1	0	250	0	0	0	195
657	0	0	0	190	0	2	7	242	0	0	0	195
659	1	0	0	189	2	4	1	244	0	0	0	195
694	0	0	0	190	4	5	9	233	0	0	0	195
700	0	0	0	190	0	1	0	250	0	0	0	195
726	0	0	1	189	1	0	0	250	0	0	0	195
735	1	1	1	187	0	1	0	250	0	0	4	191
739	0	3	0	187	0	0	0	251	0	0	0	195
744	0	0	0	190	0	3	0	248	0	0	0	195
745	0	0	0	190	7	2	7	235	0	0	0	195
749	0	0	0	190	0	0	1	250	0	0	0	195
754	0	0	1	189	0	1	0	250	0	0	0	195
759	1	3	4	182	1	4	4	242	0	0	0	195
760	0	0	1	189	0	0	0	251	0	0	0	195
761	0	0	2	188	0	0	0	251	0	0	0	195
762	0	0	0	190	0	2	0	249	0	0	0	195
763	0	0	2	188	0	0	0	251	0	0	0	195
764	0	0	3	187	0	1	0	250	0	0	0	195

766	0	0	0	190	0	1	0	250	0	0	0	195
768	0	2	1	187	0	0	1	250	0	0	0	195
769	0	1	0	189	0	1	0	250	0	0	0	195
773	0	0	2	188	0	1	3	247	0	0	0	195
780	0	1	0	189	0	0	0	251	0	0	0	195
786	0	0	0	190	0	1	0	250	0	0	0	195
789	0	0	0	190	0	0	1	250	0	0	0	195
793	0	1	4	185	4	0	3	244	0	0	0	195
794	0	0	0	190	0	1	0	250	0	0	0	195
795	0	6	4	180	4	2	17	228	0	4	1	190
820	0	0	0	190	2	1	7	241	0	0	1	194
830	0	0	0	190	0	0	3	248	0	0	0	195
832	0	0	0	190	0	2	0	249	0	0	0	195
833	0	0	0	190	0	2	0	249	0	0	0	195
843	0	1	0	189	0	1	0	250	0	0	0	195
849	0	0	0	190	0	0	1	250	0	0	0	195
852	0	1	4	185	1	2	0	248	0	0	0	195
856	0	0	1	189	0	1	0	250	0	0	0	195
857	0	0	1	189	0	0	1	250	0	0	0	195
858	0	0	0	190	0	0	1	250	0	0	0	195
860	0	0	0	190	0	0	1	250	0	0	0	195
861	0	0	0	190	0	0	2	249	0	0	0	195
862	0	0	0	190	0	0	1	250	0	0	0	195
865	0	0	0	190	1	7	1	242	0	0	0	195
866	0	0	1	189	0	2	1	248	0	0	0	195
869	0	0	0	190	0	1	0	250	0	0	0	195
873	0	0	0	190	0	0	1	250	0	0	0	195
876	0	0	0	190	0	0	3	248	0	0	0	195
878	0	0	0	190	0	0	1	250	0	0	0	195
880	0	0	1	189	0	0	0	251	0	0	0	195
896	0	1	0	189	3	3	0	245	0	0	0	195

910	1	0	0	189	0	0	2	249	0	0	0	195
950	1	0	2	187	0	0	1	250	0	0	0	195

Table 16. Species code, vessel-specific mean catches (counts) and correlation estimate (Kendall's τ) and corresponding p-value for species with some catch on either vessel at all stations. Correlation is inestimable when there was no catch by one of the vessels.

SVSPP	Mean Albatross Catch/Tow (Count)	Mean Bigelow Catch/Tow (Count)	Correlation	p-value
1	0.0755	0.1274	0.2640	$< 10^{-4}$
2	0.0000	0.0016		
3	0.0000	0.0094		
4	0.1148	0.1541	0.5752	$< 10^{-4}$
7	0.0016	0.0000		
9	0.0063	0.0126	$\lvert x \rvert < 10^{-4}$	0.8902
12	0.0047	0.0000		
13	0.9104	0.9701	0.7012	$< 10^{-4}$
14	0.1022	0.6903	0.5645	$< 10^{-4}$
15	50.4387	67.2469	0.8139	$< 10^{-4}$
16	0.0440	0.1038	0.5891	$< 10^{-4}$
18	0.1321	0.1824	0.6054	$< 10^{-4}$
19	0.1399	0.1903	0.7300	$< 10^{-4}$
21	0.0094	0.0063	$\lvert x \rvert < 10^{-4}$	0.8449
22	0.4906	1.6604	0.4972	$< 10^{-4}$
23	3.9811	13.6132	0.6810	$< 10^{-4}$
24	0.2767	1.7594	0.6606	$< 10^{-4}$
25	0.0739	0.2987	0.5706	$< 10^{-4}$
26	9.3538	44.0440	0.6866	$< 10^{-4}$
27	0.4119	1.3821	0.5626	$< 10^{-4}$
28	0.3239	1.2469	0.6039	$< 10^{-4}$
29	0.0157	0.0063	0.4963	$< 10^{-4}$
30	0.0189	0.0000		

31	107.2720	71.8491	0.6926	$< 10^{-4}$
32	14.6509	70.2783	0.6686	$< 10^{-4}$
33	3.6478	6.7406	0.6468	$< 10^{-4}$
34	1.1053	3.9560	0.5320	$< 10^{-4}$
35	0.2296	0.4182	0.3872	$< 10^{-4}$
36	0.0220	0.1258	0.1994	$< 10^{-4}$
43	389.2233	18.6321	0.5693	$< 10^{-4}$
44	14.3679	16.7469	0.5916	$< 10^{-4}$
46	0.1462	0.1682	0.0891	0.0240
56	5.3884	2.4151	0.7021	$< 10^{-4}$
60	0.0220	0.0031	$\lvert x \rvert < 10^{-4}$	0.8580
63	0.0016	0.0000		
65	0.0063	0.0000		
66	0.0063	0.0000		
67	0.0000	0.0016		
69	0.0362	0.1053	0.7418	$< 10^{-4}$
72	32.6588	192.2862	0.7717	$< 10^{-4}$
73	1.1038	2.6242	0.6706	$< 10^{-4}$
74	23.6682	33.4088	0.8403	$< 10^{-4}$
75	0.3994	3.7044	0.5402	$< 10^{-4}$
76	2.1384	4.4434	0.7141	$< 10^{-4}$
77	7.6950	26.9340	0.7034	$< 10^{-4}$
78	9.3774	26.6808	0.7024	$< 10^{-4}$
79	0.0283	0.3381	0.3729	$< 10^{-4}$
83	0.0472	0.3066	0.3354	$< 10^{-4}$
84	0.0142	0.0566	0.2937	$< 10^{-4}$
87	0.1368	0.0550	$\lvert x \rvert < 10^{-4}$	0.6873

90	0.0142	0.1053	0.1032	0.0089
91	0.0031	0.0566	0.5314	$< 10^{-4}$
99	0.0047	0.0142	0.2315	$< 10^{-4}$
101	0.0425	0.0472	0.3597	$< 10^{-4}$
102	4.1887	8.8208	0.8116	$< 10^{-4}$
103	1.1698	2.4717	0.7633	$< 10^{-4}$
104	4.9984	13.9355	0.7186	$< 10^{-4}$
105	5.0755	11.0377	0.7892	$< 10^{-4}$
106	1.8553	4.3035	0.7681	$< 10^{-4}$
107	0.6053	1.8459	0.6213	$< 10^{-4}$
108	1.1682	2.5959	0.6782	$< 10^{-4}$
109	2.9701	32.6509	0.6167	$< 10^{-4}$
111	0.0031	0.0047	$\vert x \vert < 10^{-4}$	0.9366
112	0.0283	0.0991	0.7324	$< 10^{-4}$
113	0.1352	0.0519	0.5160	$< 10^{-4}$
114	0.0283	0.0440	0.3786	$< 10^{-4}$
115	0.0047	0.0016	0.5764	$< 10^{-4}$
116	0.0031	0.0031	$\vert x \vert < 10^{-4}$	0.9366
117	0.3192	0.8742	0.3801	$< 10^{-4}$
118	0.0000	0.0031		
120	0.0000	0.0031		
121	9.2296	23.7217	0.5665	$< 10^{-4}$
124	0.5849	0.0126	0.1992	$< 10^{-4}$
126	0.0755	0.0991	0.2644	$< 10^{-4}$
127	0.0063	0.0016	$\vert x \vert < 10^{-4}$	0.9683
129	0.6305	0.3019	0.6281	$< 10^{-4}$
131	120.9497	183.5000	0.7046	$< 10^{-4}$

132	0.2138	0.1509	0.3102	$< 10^{-4}$
133	0.0000	0.0079		
134	0.0016	0.0000		
135	1.6903	2.1840	0.6683	$< 10^{-4}$
136	35.3176	35.0629	0.8661	$< 10^{-4}$
137	0.0031	0.0047	$\|x\| < 10^{-4}$	0.9552
139	0.1730	0.1132	0.3430	$< 10^{-4}$
141	0.8223	2.4214	0.4959	$< 10^{-4}$
142	0.0881	0.2862	0.4557	$< 10^{-4}$
143	58.9387	100.5110	0.7888	$< 10^{-4}$
145	5.9041	14.0236	0.7832	$< 10^{-4}$
146	0.0236	0.1761	0.3406	$< 10^{-4}$
148	0.0047	0.0236	0.7043	$< 10^{-4}$
149	26.7704	60.6557	0.8826	$< 10^{-4}$
151	0.0031	0.0157	0.3126	$< 10^{-4}$
154	0.0016	0.0063	$\|x\| < 10^{-4}$	0.9683
155	33.9528	44.9953	0.8689	$< 10^{-4}$
156	0.8632	2.3774	0.5846	$< 10^{-4}$
158	0.0094	0.1132	0.5731	$< 10^{-4}$
159	0.0173	0.1006	0.3664	$< 10^{-4}$
160	0.0016	0.0267	$\|x\| < 10^{-4}$	0.9552
161	0.1887	1.1572	0.6272	$< 10^{-4}$
163	4.4450	15.3286	0.8038	$< 10^{-4}$
164	0.7453	1.3884	0.5120	$< 10^{-4}$
165	0.0896	0.5252	0.4168	$< 10^{-4}$
166	0.0000	0.0142		
168	0.0283	0.0629	0.2330	$< 10^{-4}$

170	0.0975	0.0079	$\lvert x \rvert < 10^{-4}$	0.8654
171	3.5063	14.5000	0.6156	$< 10^{-4}$
172	0.3475	1.1981	0.6153	$< 10^{-4}$
173	0.0613	0.1572	0.3718	$< 10^{-4}$
174	0.0362	0.8978	0.0738	0.0607
175	0.0000	0.0031		
176	0.0393	0.1101	0.4645	$< 10^{-4}$
177	0.0110	0.0126	0.2464	$< 10^{-4}$
179	0.0157	0.0157	0.1219	0.0021
180	0.0047	0.0016	$\lvert x \rvert < 10^{-4}$	0.9451
181	9.0786	24.5566	0.3815	$< 10^{-4}$
183	0.1447	0.0000		
184	0.0031	0.0031	$\lvert x \rvert < 10^{-4}$	0.9552
186	0.0016	0.0031	0.7065	$< 10^{-4}$
187	0.0016	0.0142	0.4459	$< 10^{-4}$
188	0.0110	0.1148	0.3173	$< 10^{-4}$
190	0.0016	0.0016	$\lvert x \rvert < 10^{-4}$	0.9683
191	0.0110	0.0440	0.0976	0.0136
192	0.0157	0.0377	0.3166	$< 10^{-4}$
193	0.8585	3.4921	0.5079	$< 10^{-4}$
194	0.6305	1.6384	0.7475	$< 10^{-4}$
195	0.0000	0.0016		
196	0.0770	0.2987	0.5500	$< 10^{-4}$
197	0.2484	1.5991	0.3916	$< 10^{-4}$
198	0.0110	0.0173	0.2842	$< 10^{-4}$
199	0.0000	0.0110		
201	0.0613	0.0975	0.2685	$< 10^{-4}$

202	0.0063	0.0299	$\|x\|<10^{-4}$	0.8180
203	0.0063	0.0000		
204	0.0079	0.0519	$\|x\|<10^{-4}$	0.8449
205	0.0016	0.1808	$\|x\|<10^{-4}$	0.8808
206	0.0000	0.0031		
208	0.0063	0.0047	$\|x\|<10^{-4}$	0.9552
209	0.4355	0.1840	0.5937	$<10^{-4}$
211	1.4072	1.7296	0.4500	$<10^{-4}$
212	0.7783	1.0047	0.4063	$<10^{-4}$
213	0.0016	0.0094	$\|x\|<10^{-4}$	0.9552
221	0.0755	0.0660	0.1079	0.0061
228	0.0000	0.0031		
229	1.4041	0.2296	0.3587	$<10^{-4}$
232	0.1305	0.1824	0.6575	$<10^{-4}$
239	0.0000	0.0031		
240	0.0079	0.0000		
242	0.0566	0.0739	0.2521	$<10^{-4}$
246	0.0000	0.0094		
249	0.0000	0.0031		
252	0.0047	0.0362	0.4996	$<10^{-4}$
262	0.0330	0.0016	0.4467	$<10^{-4}$
263	0.0079	0.1148	0.1602	0.0001
270	0.0126	0.0770	0.4313	$<10^{-4}$
301	1.0393	1.5802	0.5258	$<10^{-4}$
302	0.0110	0.0110	1.0000	$<10^{-4}$
305	0.0000	0.0063		
307	0.4874	3.0487	0.5089	$<10^{-4}$

310	0.0142	0.0865	0.3553	$<10^{-4}$
311	0.0047	0.1619	$\lvert x \rvert<10^{-4}$	0.8997
312	0.1415	0.4811	0.2483	$<10^{-4}$
313	0.6038	2.7972	0.5227	$<10^{-4}$
314	0.0031	0.0220	$\lvert x \rvert<10^{-4}$	0.8580
316	0.0173	1.3365	0.3762	$<10^{-4}$
317	0.0472	0.2075	0.1202	0.0021
318	0.0613	0.3066	0.3752	$<10^{-4}$
319	0.1038	1.7862	0.5685	$<10^{-4}$
320	0.2956	2.8270	0.4597	$<10^{-4}$
321	0.0236	0.2893	0.2208	$<10^{-4}$
322	1.8381	6.6855	0.4231	$<10^{-4}$
323	0.0016	0.0267	$\lvert x \rvert<10^{-4}$	0.9046
324	0.0173	0.0362	0.3439	$<10^{-4}$
325	0.0047	0.0409	$\lvert x \rvert<10^{-4}$	0.8731
327	0.0016	0.0000		
339	0.0016	0.0016	$\lvert x \rvert<10^{-4}$	0.9683
360	0.1258	0.0519	0.7030	$<10^{-4}$
364	0.0000	0.0016		
375	0.1164	0.0928	0.6627	$<10^{-4}$
376	0.0346	0.1336	0.7416	$<10^{-4}$
378	0.0000	0.0031		
380	0.0079	0.0016	$\lvert x \rvert<10^{-4}$	0.9552
384	0.0000	0.0063		
388	0.0000	0.0063		
390	0.0189	0.0566	0.2380	$<10^{-4}$
396	0.0000	0.0063		

401	24.5975	76.6887	0.7096	$< 10^{-4}$
421	0.0220	0.0770	$\lvert x \rvert < 10^{-4}$	0.5904
425	0.0047	0.0063	$\lvert x \rvert < 10^{-4}$	0.9049
428	0.6132	3.0425	0.6417	$< 10^{-4}$
429	0.3239	0.2547	0.5459	$< 10^{-4}$
435	0.1761	0.6164	0.6171	$< 10^{-4}$
437	0.0079	0.0000		
438	0.0031	0.0000		
439	0.1038	0.5110	0.8221	$< 10^{-4}$
444	0.0031	0.0142	0.7074	$< 10^{-4}$
446	0.0000	0.0016		
449	0.0063	0.0126	0.4990	$< 10^{-4}$
451	0.0031	0.0094	$\lvert x \rvert < 10^{-4}$	0.9552
452	0.0000	0.0126		
457	0.0000	0.0204		
458	0.0031	0.0016	$\lvert x \rvert < 10^{-4}$	0.9683
459	0.0063	0.0016	$\lvert x \rvert < 10^{-4}$	0.9552
461	0.0110	0.0535	$\lvert x \rvert < 10^{-4}$	0.8773
462	0.0016	0.0000		
465	0.0031	0.0031	1.0000	$< 10^{-4}$
471	0.0000	0.0204		
489	0.0157	0.0425	0.2274	$< 10^{-4}$
490	0.0016	0.0063	$\lvert x \rvert < 10^{-4}$	0.9451
492	0.0016	0.0000		
501	0.0582	0.0173	0.1432	0.0003
502	7.9921	10.7406	0.6033	$< 10^{-4}$
503	282.7091	312.3553	0.7995	$< 10^{-4}$

504	0.0582	0.0409	0.5449	$< 10^{-4}$
506	0.0770	1.5676	0.3628	$< 10^{-4}$
508	0.0000	0.0016		
509	0.0000	0.1808		
510	0.0000	0.0094		
511	0.0000	0.0031		
512	0.2909	0.5063	0.4567	$< 10^{-4}$
516	0.0157	0.0016	$\|x\| < 10^{-4}$	0.9683
517	0.0016	0.0079	$\|x\| < 10^{-4}$	0.9451
526	0.0000	0.0079		
527	0.0000	0.0204		
530	0.0016	0.0110	0.4991	$< 10^{-4}$
538	0.0000	0.0016		
541	0.0000	0.0031		
546	0.0000	0.0047		
551	0.0000	0.0016		
552	0.0016	0.0031	$\|x\| < 10^{-4}$	0.9683
556	0.0016	0.0000		
557	0.0016	0.0000		
563	0.0047	0.0031	0.4060	$< 10^{-4}$
564	0.0000	0.0016		
567	0.0047	0.0031	$\|x\| < 10^{-4}$	0.9224
568	0.0031	0.0016	$\|x\| < 10^{-4}$	0.9552
570	0.0047	0.0063	0.3311	$< 10^{-4}$
573	0.1887	0.0456	0.5157	$< 10^{-4}$
579	0.0016	0.0000		
596	0.0047	0.0016	$\|x\| < 10^{-4}$	0.9552
599	0.0110	0.0000		

604	0.0063	0.0126	0.4959	$< 10^{-4}$
616	0.0031	0.0031	$\|x\| < 10^{-4}$	0.9552
617	0.0000	0.0016		
621	0.0000	0.0047		
625	0.0016	0.0016	$\|x\| < 10^{-4}$	0.9683
627	0.0204	0.0000		
631	0.0031	0.0047	$\|x\| < 10^{-4}$	0.9451
640	0.3019	1.6808	0.6850	$< 10^{-4}$
646	0.0126	0.0000		
648	0.0000	0.0016		
651	0.5204	1.5173	0.7553	$< 10^{-4}$
652	1.3679	2.5660	0.7201	$< 10^{-4}$
654	0.0016	0.0000		
657	0.0031	0.0220	$\|x\| < 10^{-4}$	0.8813
659	0.0566	0.0094	0.5607	$< 10^{-4}$
694	0.0236	0.0503	0.3550	$< 10^{-4}$
700	0.0016	0.0000		
726	0.0063	0.0079	0.7074	$< 10^{-4}$
735	0.0063	0.0456	0.2309	$< 10^{-4}$
739	0.0047	0.0000		
744	0.0047	0.0000		
745	0.1965	0.2044	0.6199	$< 10^{-4}$
749	0.0000	0.0047		
754	0.0016	0.0079	$\|x\| < 10^{-4}$	0.9683
759	0.0314	0.0865	0.2003	$< 10^{-4}$
760	0.0000	0.0031		
761	0.0000	0.0063		
762	0.0173	0.0000		

763	0.0000	0.0047		
764	0.0031	0.0173	$\lvert x \rvert < 10^{-4}$	0.9451
766	0.0016	0.0000		
768	0.0204	0.0204	$\lvert x \rvert < 10^{-4}$	0.9366
769	0.0063	0.0000		
773	0.0016	0.0456	$\lvert x \rvert < 10^{-4}$	0.9291
780	0.0047	0.0000		
786	0.0016	0.0000		
789	0.0000	0.0016		
793	0.0220	0.1840	0.5352	$< 10^{-4}$
794	0.0299	0.0000		
795	0.1085	0.5031	0.1736	$< 10^{-4}$
820	0.0063	0.0629	0.3606	$< 10^{-4}$
830	0.0000	0.0157		
832	0.0031	0.0000		
833	0.0063	0.0000		
843	0.0047	0.0000		
849	0.0000	0.0016		
852	0.2909	0.1195	0.2200	$< 10^{-4}$
856	0.0016	0.0079	$\lvert x \rvert < 10^{-4}$	0.9683
857	0.0000	0.0047		
858	0.0000	0.0314		
860	0.0000	0.0016		
861	0.0000	0.0047		
862	0.0000	0.0016		
865	8.9623	0.3585	0.2437	$< 10^{-4}$
866	0.0047	0.0094	$\lvert x \rvert < 10^{-4}$	0.9366
869	0.0016	0.0000		
873	0.0000	0.0031		

876	0.0000	0.0063		
878	0.0000	0.0031		
880	0.0000	0.0016		
896	0.0330	0.0142	0.6522	$< 10^{-4}$
910	0.0943	0.0456	0.5778	$< 10^{-4}$
950	0.0031	0.0079	0.5009	$< 10^{-4}$

Table 17. Species code, vessel-specific mean catches (counts) and correlation estimate (Kendall's τ) and corresponding p-value for species with some catch on either vessel at stations within the spring survey. Correlation is inestimable when there was no catch by one of the vessels.

SVSPP	Mean Albatross Catch/Tow (Count)	Mean Bigelow Catch/Tow (Count)	Correlation	p-value
1	0.0263	0.1737	0.2037	0.0048
2	0.0000	0.0053		
3	0.0000	0.0316		
4	0.2000	0.2316	0.7480	$< 10^{-4}$
9	0.0000	0.0368		
12	0.0158	0.0000		
13	1.0000	1.1737	0.7156	$< 10^{-4}$
14	0.0947	0.4579	0.5025	$< 10^{-4}$
15	63.6053	93.1053	0.8050	$< 10^{-4}$
16	0.0947	0.2158	0.6695	$< 10^{-4}$
18	0.0368	0.0105	$\lvert x \rvert < 10^{-4}$	0.8992
19	0.0053	0.0053	1.0000	$< 10^{-4}$
21	0.0053	0.0105	$\lvert x \rvert < 10^{-4}$	0.9179
22	0.7211	1.6316	0.4879	$< 10^{-4}$

23	4.2737	19.5526	0.5179	$< 10^{-4}$
24	0.2053	1.7526	0.6391	$< 10^{-4}$
25	0.1263	0.3895	0.4035	$< 10^{-4}$
26	19.1000	58.8263	0.6964	$< 10^{-4}$
27	0.8474	1.1421	0.5946	$< 10^{-4}$
28	0.1526	0.6316	0.6019	$< 10^{-4}$
29	0.0211	0.0211	0.7024	$< 10^{-4}$
30	0.0053	0.0000		
31	0.3368	0.0684	0.8089	$< 10^{-4}$
32	22.8263	94.8947	0.5341	$< 10^{-4}$
33	7.3842	16.0000	0.7637	$< 10^{-4}$
34	1.7158	8.0895	0.6348	$< 10^{-4}$
35	0.2737	0.3632	0.4645	$< 10^{-4}$
36	0.0316	0.0105	$\lvert x \rvert < 10^{-4}$	0.8837
43	48.6053	10.9737	0.7266	$< 10^{-4}$
44	0.9789	0.0000		
46	0.4842	0.0158	$\lvert x \rvert < 10^{-4}$	0.7532
56	2.8789	0.3895	0.6159	$< 10^{-4}$
60	0.0632	0.0000		
63	0.0053	0.0000		
69	0.0316	0.1158	0.8176	$< 10^{-4}$
72	22.4895	187.9737	0.7680	$< 10^{-4}$
73	1.0158	2.2158	0.7066	$< 10^{-4}$
74	16.0947	15.6368	0.7981	$< 10^{-4}$
75	0.4789	0.5316	0.6752	$< 10^{-4}$
76	1.9158	4.3684	0.7406	$< 10^{-4}$
77	5.4579	23.9316	0.6817	$< 10^{-4}$

78	16.1579	54.6789	0.7148	$< 10^{-4}$
79	0.0316	0.1789	0.6989	$< 10^{-4}$
83	0.0684	0.2579	0.5567	$< 10^{-4}$
84	0.0105	0.0632	0.3108	$< 10^{-4}$
87	0.0474	0.0000		
90	0.0211	0.2105	0.2067	0.0041
99	0.0053	0.0316	0.4510	$< 10^{-4}$
101	0.0316	0.0474	0.3880	$< 10^{-4}$
102	1.2947	2.7105	0.7064	$< 10^{-4}$
103	0.7000	2.2579	0.7029	$< 10^{-4}$
104	5.1684	16.0158	0.7394	$< 10^{-4}$
105	3.6947	7.7211	0.7377	$< 10^{-4}$
106	2.3053	3.7000	0.7220	$< 10^{-4}$
107	0.9526	2.3579	0.6600	$< 10^{-4}$
108	0.8421	2.6105	0.6755	$< 10^{-4}$
109	1.0579	14.8842	0.5478	$< 10^{-4}$
111	0.0000	0.0105		
112	0.0105	0.0158	0.9987	$< 10^{-4}$
113	0.4421	0.1737	0.5766	$< 10^{-4}$
114	0.0263	0.1474	1.0000	$< 10^{-4}$
116	0.0000	0.0105		
117	1.0000	1.6737	0.4661	$< 10^{-4}$
118	0.0000	0.0105		
120	0.0000	0.0053		
121	23.9368	74.9947	0.7075	$< 10^{-4}$
126	0.2263	0.1474	0.8161	$< 10^{-4}$
127	0.0000	0.0053		
131	73.9737	117.6789	0.7254	$< 10^{-4}$

135	0.0158	0.1000	0.5075	$< 10^{-4}$
136	18.2263	6.2737	0.7396	$< 10^{-4}$
139	0.3579	0.3000	0.5590	$< 10^{-4}$
141	0.3053	1.0632	0.3005	$< 10^{-4}$
142	0.0053	0.0211	$\lvert x \rvert < 10^{-4}$	0.9420
143	5.0158	6.8789	0.6123	$< 10^{-4}$
145	2.0263	25.4158	0.7480	$< 10^{-4}$
146	0.0316	0.0316	$\lvert x \rvert < 10^{-4}$	0.8353
148	0.0158	0.0421	0.8132	$< 10^{-4}$
149	0.9842	28.0421	0.6990	$< 10^{-4}$
154	0.0053	0.0211	$\lvert x \rvert < 10^{-4}$	0.9420
155	20.9632	32.3000	0.8350	$< 10^{-4}$
156	2.0263	4.5684	0.6974	$< 10^{-4}$
158	0.0211	0.2474	0.6286	$< 10^{-4}$
160	0.0053	0.0895	$\lvert x \rvert < 10^{-4}$	0.9179
161	0.1789	0.9211	0.5436	$< 10^{-4}$
163	4.3421	14.4263	0.8498	$< 10^{-4}$
164	0.7895	1.1526	0.6003	$< 10^{-4}$
165	0.1263	0.0632	0.1698	0.0187
168	0.0000	0.0263		
170	0.0000	0.0263		
171	3.5421	10.1947	0.5950	$< 10^{-4}$
172	0.2684	2.2000	0.6049	$< 10^{-4}$
173	0.1474	0.3368	0.5912	$< 10^{-4}$
174	0.1000	0.1105	0.3118	$< 10^{-4}$
176	0.0000	0.0263		
177	0.0000	0.0053		

179	0.0000	0.0158		
180	0.0053	0.0000		
181	6.3263	0.3263	0.3725	$< 10^{-4}$
184	0.0053	0.0000		
188	0.0053	0.0053	$\|x\| < 10^{-4}$	0.9420
190	0.0053	0.0000		
191	0.0053	0.0895	$\|x\| < 10^{-4}$	0.8450
192	0.0000	0.0158		
193	0.4684	3.5105	0.5425	$< 10^{-4}$
194	0.6737	1.0105	0.6600	$< 10^{-4}$
196	0.0105	0.0579	0.3486	$< 10^{-4}$
197	0.1316	1.2053	0.4048	$< 10^{-4}$
199	0.0000	0.0368		
201	0.0053	0.0053	$\|x\| < 10^{-4}$	0.9420
202	0.0105	0.0000		
206	0.0000	0.0105		
208	0.0000	0.0105		
211	0.0053	0.0000		
212	0.0632	0.0000		
221	0.0737	0.0526	0.1428	0.0472
229	1.1684	0.5105	$\|x\| < 10^{-4}$	0.8992
232	0.2632	0.4211	0.8580	$< 10^{-4}$
239	0.0000	0.0105		
242	0.0158	0.2421	0.3979	$< 10^{-4}$
262	0.0053	0.0000		
263	0.0158	0.0263	$\|x\| < 10^{-4}$	0.8837
301	0.9842	1.1579	0.6330	$< 10^{-4}$
307	0.6211	1.2053	0.5822	$< 10^{-4}$

310	0.0158	0.0895	0.3463	$< 10^{-4}$
311	0.0000	0.5316		
312	0.0632	0.2421	$\lvert x \rvert < 10^{-4}$	0.9203
313	0.8684	3.8158	0.5096	$< 10^{-4}$
316	0.0316	0.7526	0.7080	$< 10^{-4}$
317	0.0737	0.1526	0.0400	0.5760
318	0.1579	0.5842	0.4386	$< 10^{-4}$
319	0.2316	4.3789	0.7437	$< 10^{-4}$
320	0.0105	2.3368	$\lvert x \rvert < 10^{-4}$	0.6895
321	0.0211	0.0368	$\lvert x \rvert < 10^{-4}$	0.7985
322	0.0211	0.0579	$\lvert x \rvert < 10^{-4}$	0.7532
323	0.0000	0.0263		
324	0.0053	0.0000		
325	0.0000	0.0421		
327	0.0053	0.0000		
339	0.0053	0.0053	$\lvert x \rvert < 10^{-4}$	0.9420
360	0.0263	0.0000		
375	0.0895	0.0158	0.5642	$< 10^{-4}$
376	0.0053	0.0053	1.0000	$< 10^{-4}$
378	0.0000	0.0105		
380	0.0211	0.0053	$\lvert x \rvert < 10^{-4}$	0.9420
384	0.0000	0.0211		
388	0.0000	0.0053		
390	0.0158	0.0421	$\lvert x \rvert < 10^{-4}$	0.8567
401	18.6158	86.4526	0.6824	$< 10^{-4}$
421	0.0263	0.0263	$\lvert x \rvert < 10^{-4}$	0.7403
425	0.0105	0.0053	$\lvert x \rvert < 10^{-4}$	0.9179

435	0.2053	0.4526	0.5913	$< 10^{-4}$
437	0.0211	0.0000		
438	0.0105	0.0000		
439	0.0158	0.1632	0.9947	$< 10^{-4}$
446	0.0000	0.0053		
449	0.0105	0.0421	0.7080	$< 10^{-4}$
451	0.0000	0.0316		
457	0.0000	0.0053		
459	0.0000	0.0053		
461	0.0053	0.0053	$\lvert x \rvert < 10^{-4}$	0.9420
489	0.0263	0.0211	0.5763	$< 10^{-4}$
490	0.0000	0.0105		
501	0.0842	0.0000		
502	0.9947	2.1368	0.6961	$< 10^{-4}$
503	181.9263	271.0368	0.8039	$< 10^{-4}$
504	0.1842	0.0895	0.8132	$< 10^{-4}$
506	0.2316	4.8421	0.5643	$< 10^{-4}$
509	0.0000	0.4053		
510	0.0000	0.0263		
512	0.3579	0.4789	0.7377	$< 10^{-4}$
516	0.0526	0.0053	$\lvert x \rvert < 10^{-4}$	0.9420
517	0.0053	0.0000		
527	0.0000	0.0684		
530	0.0053	0.0105	1.0000	$< 10^{-4}$
551	0.0000	0.0053		
564	0.0000	0.0053		
596	0.0000	0.0053		
604	0.0000	0.0053		
621	0.0000	0.0158		

631	0.0105	0.0105	$\lvert x \rvert < 10^{-4}$	0.9179
640	0.1421	5.1895	0.7080	$< 10^{-4}$
651	0.7789	0.0263	0.5728	$< 10^{-4}$
652	0.0737	0.5105	0.5938	$< 10^{-4}$
659	0.0053	0.0053	1.0000	$< 10^{-4}$
726	0.0000	0.0105		
735	0.0158	0.0263	0.4934	$< 10^{-4}$
739	0.0158	0.0000		
754	0.0000	0.0263		
759	0.0211	0.2105	0.2087	0.0039
760	0.0000	0.0105		
761	0.0000	0.0211		
763	0.0000	0.0158		
764	0.0000	0.0579		
768	0.0684	0.0632	$\lvert x \rvert < 10^{-4}$	0.9179
769	0.0105	0.0000		
773	0.0000	0.1000		
780	0.0158	0.0000		
793	0.0053	0.3053	$\lvert x \rvert < 10^{-4}$	0.8834
795	0.0421	0.2632	$\lvert x \rvert < 10^{-4}$	0.7159
843	0.0053	0.0000		
852	0.0105	0.0737	$\lvert x \rvert < 10^{-4}$	0.8834
856	0.0000	0.0263		
857	0.0000	0.0053		
866	0.0000	0.0263		
880	0.0000	0.0053		
896	0.0053	0.0000		
910	0.3158	0.1368	1.0000	$< 10^{-4}$

950	0.0105	0.0211	0.5794	$< 10^{-4}$

Table 18. Species code, vessel-specific mean catches (counts) and correlation estimate (Kendall's τ) and corresponding p-value for species with some catch on either vessel at stations within the fall survey. Correlation is inestimable when there was no catch by one of the vessels.

SVSPP	Mean Albatross Catch/Tow (Count)	Mean Bigelow Catch/Tow (Count)	Correlation	p-value
1	0.0996	0.0598	0.2398	0.0001
4	0.1394	0.2151	0.5182	$< 10^{-4}$
7	0.0040	0.0000		
9	0.0159	0.0040	$\lvert x \rvert < 10^{-4}$	0.8987
13	1.1952	1.2390	0.6800	$< 10^{-4}$
14	0.1235	1.0279	0.4907	$< 10^{-4}$
15	26.8884	38.8406	0.7896	$< 10^{-4}$
16	0.0398	0.0996	0.5174	$< 10^{-4}$
18	0.3068	0.4542	0.6665	$< 10^{-4}$
19	0.3506	0.4781	0.7067	$< 10^{-4}$
21	0.0040	0.0080	$\lvert x \rvert < 10^{-4}$	0.9286
22	0.4701	1.8884	0.4720	$< 10^{-4}$
23	3.4661	9.0438	0.8062	$< 10^{-4}$
24	0.5418	3.1315	0.6766	$< 10^{-4}$
25	0.0916	0.4622	0.6669	$< 10^{-4}$
26	3.1434	31.2789	0.7024	$< 10^{-4}$
27	0.1116	0.7251	0.4576	$< 10^{-4}$
28	0.0717	0.4821	0.4374	$< 10^{-4}$

29	0.0239	0.0000		
31	271.5418	182.0000	0.6423	$< 10^{-4}$
32	9.2351	21.1355	0.8385	$< 10^{-4}$
33	1.4382	2.8167	0.8399	$< 10^{-4}$
34	0.0757	0.1514	0.5792	$< 10^{-4}$
35	0.2072	0.4064	0.6139	$< 10^{-4}$
36	0.0239	0.3108	0.2881	$< 10^{-4}$
43	932.3147	38.8964	0.5898	$< 10^{-4}$
44	35.6653	42.4343	0.6048	$< 10^{-4}$
46	0.0040	0.0916	0.3394	$< 10^{-4}$
56	11.2191	5.8207	0.8582	$< 10^{-4}$
60	0.0000	0.0040		
65	0.0159	0.0000		
66	0.0159	0.0000		
67	0.0000	0.0040		
69	0.0677	0.1793	0.7112	$< 10^{-4}$
72	28.1076	156.4223	0.8040	$< 10^{-4}$
73	0.4064	1.5817	0.6732	$< 10^{-4}$
74	9.2908	16.3665	0.7922	$< 10^{-4}$
75	0.2829	0.3108	0.6584	$< 10^{-4}$
76	2.1594	4.2151	0.7455	$< 10^{-4}$
77	6.0677	20.6016	0.7504	$< 10^{-4}$
78	9.6414	22.3586	0.7244	$< 10^{-4}$
79	0.0438	0.6733	0.2264	0.0003
83	0.0239	0.2590	0.1466	0.0185
84	0.0199	0.0319	0.3489	$< 10^{-4}$
87	0.2470	0.0837	$\lvert x \rvert < 10^{-4}$	0.6752

90	0.0199	0.1076	$\lvert x \rvert < 10^{-4}$	0.8042
91	0.0080	0.1434	0.5265	$< 10^{-4}$
99	0.0080	0.0120	$\lvert x \rvert < 10^{-4}$	0.9286
101	0.0637	0.0438	0.4970	$< 10^{-4}$
102	4.7291	10.3227	0.8243	$< 10^{-4}$
103	1.2351	2.9641	0.8431	$< 10^{-4}$
104	4.4223	10.4183	0.6878	$< 10^{-4}$
105	5.8685	14.0956	0.8234	$< 10^{-4}$
106	1.7649	4.6853	0.8177	$< 10^{-4}$
107	0.5657	1.9323	0.7393	$< 10^{-4}$
108	1.7928	3.6653	0.6616	$< 10^{-4}$
109	2.5139	15.1434	0.6104	$< 10^{-4}$
111	0.0080	0.0040	$\lvert x \rvert < 10^{-4}$	0.9286
112	0.0518	0.1833	0.7053	$< 10^{-4}$
114	0.0518	0.0000		
115	0.0120	0.0040	0.5750	$< 10^{-4}$
117	0.0239	0.7888	0.1946	0.0018
120	0.0000	0.0040		
121	1.0478	0.6016	0.3892	$< 10^{-4}$
124	1.4821	0.0319	0.1915	0.0023
126	0.0199	0.1394	$\lvert x \rvert < 10^{-4}$	0.7524
127	0.0159	0.0000		
129	1.5976	0.7649	0.6180	$< 10^{-4}$
131	149.4661	318.8845	0.6950	$< 10^{-4}$
132	0.5418	0.3745	0.2983	$< 10^{-4}$
133	0.0000	0.0199		
134	0.0040	0.0000		

135	4.1753	5.4064	0.6849	$<10^{-4}$
136	75.6932	84.0956	0.8714	$<10^{-4}$
137	0.0080	0.0120	$\|x\|<10^{-4}$	0.9286
139	0.0120	0.0120	$\|x\|<10^{-4}$	0.8761
141	1.5498	4.2789	0.6355	$<10^{-4}$
142	0.2191	0.7092	0.4960	$<10^{-4}$
143	127.5498	216.7410	0.8601	$<10^{-4}$
145	13.4263	16.2948	0.7739	$<10^{-4}$
146	0.0359	0.4223	0.4650	$<10^{-4}$
148	0.0000	0.0279		
149	67.0876	132.4661	0.8919	$<10^{-4}$
151	0.0040	0.0120	$\|x\|<10^{-4}$	0.9496
155	37.4143	50.4940	0.9024	$<10^{-4}$
156	0.6016	2.4622	0.4578	$<10^{-4}$
158	0.0080	0.0438	0.6269	$<10^{-4}$
159	0.0398	0.0996	0.3672	$<10^{-4}$
161	0.2749	1.2829	0.7481	$<10^{-4}$
163	3.9402	12.0518	0.7655	$<10^{-4}$
164	0.7928	1.6135	0.5644	$<10^{-4}$
165	0.0837	0.1992	0.7498	$<10^{-4}$
166	0.0000	0.0359		
168	0.0598	0.1275	0.3335	$<10^{-4}$
170	0.2470	0.0000		
171	5.0199	22.9681	0.6083	$<10^{-4}$
172	0.6056	1.2072	0.6156	$<10^{-4}$
173	0.0438	0.1394	$\|x\|<10^{-4}$	0.8245
174	0.0159	2.1912	$\|x\|<10^{-4}$	0.7118

175	0.0000	0.0080		
176	0.0478	0.1036	0.6600	$<10^{-4}$
177	0.0080	0.0279	0.5789	$<10^{-4}$
179	0.0398	0.0279	0.1287	0.0408
180	0.0040	0.0040	$\|x\|<10^{-4}$	0.9496
181	0.6534	0.2191	0.4550	$<10^{-4}$
183	0.3625	0.0000		
184	0.0040	0.0080	$\|x\|<10^{-4}$	0.9496
186	0.0040	0.0080	0.7057	$<10^{-4}$
187	0.0040	0.0359	0.4440	$<10^{-4}$
188	0.0239	0.2869	0.3589	$<10^{-4}$
191	0.0120	0.0398	0.2832	$<10^{-4}$
192	0.0239	0.0159	$\|x\|<10^{-4}$	0.8569
193	1.3068	3.3466	0.5034	$<10^{-4}$
194	0.8287	2.8685	0.7950	$<10^{-4}$
195	0.0000	0.0040		
196	0.1793	0.7052	0.5783	$<10^{-4}$
197	0.3147	1.7131	0.4496	$<10^{-4}$
198	0.0279	0.0438	0.2772	$<10^{-4}$
201	0.1514	0.2430	0.2868	$<10^{-4}$
202	0.0080	0.0757	$\|x\|<10^{-4}$	0.7617
203	0.0159	0.0000		
204	0.0199	0.1315	$\|x\|<10^{-4}$	0.7529
205	0.0040	0.4143	$\|x\|<10^{-4}$	0.8386
208	0.0159	0.0040	$\|x\|<10^{-4}$	0.9496
209	1.1036	0.4661	0.5645	$<10^{-4}$

211	3.5418	4.3825	0.4816	$< 10^{-4}$
212	1.6892	2.5458	0.5750	$< 10^{-4}$
213	0.0040	0.0239	$\lvert x \rvert < 10^{-4}$	0.9286
221	0.1355	0.1275	0.0794	0.2039
228	0.0000	0.0080		
229	2.5418	0.0239	0.5750	$< 10^{-4}$
232	0.1315	0.1434	0.5582	$< 10^{-4}$
240	0.0199	0.0000		
242	0.1315	0.0000		
246	0.0000	0.0239		
252	0.0120	0.0916	0.4990	$< 10^{-4}$
262	0.0797	0.0040	0.4977	$< 10^{-4}$
263	0.0080	0.2709	0.2621	$< 10^{-4}$
270	0.0319	0.1952	0.4233	$< 10^{-4}$
301	1.4622	2.4502	0.6198	$< 10^{-4}$
302	0.0279	0.0279	1.0000	$< 10^{-4}$
305	0.0000	0.0159		
307	0.7649	6.8127	0.4636	$< 10^{-4}$
310	0.0239	0.1394	0.4343	$< 10^{-4}$
311	0.0120	0.0080	$\lvert x \rvert < 10^{-4}$	0.9286
312	0.1873	0.5737	0.3129	$< 10^{-4}$
313	0.7012	3.1474	0.5605	$< 10^{-4}$
314	0.0080	0.0558	$\lvert x \rvert < 10^{-4}$	0.7729
316	0.0199	2.7968	0.2516	0.0001
317	0.0319	0.3944	0.2637	$< 10^{-4}$
318	0.0359	0.3347	0.2955	$< 10^{-4}$
319	0.0876	1.1673	0.4546	$< 10^{-4}$

320	0.7410	5.3904	0.6813	$< 10^{-4}$
321	0.0438	0.7052	0.2999	$< 10^{-4}$
322	4.6414	16.8964	0.4677	$< 10^{-4}$
323	0.0040	0.0478	$\|x\| < 10^{-4}$	0.8560
324	0.0239	0.0598	0.5530	$< 10^{-4}$
325	0.0120	0.0598	$\|x\| < 10^{-4}$	0.8399
360	0.2988	0.1315	0.7406	$< 10^{-4}$
364	0.0000	0.0040		
375	0.2271	0.2231	0.6991	$< 10^{-4}$
376	0.0837	0.3347	0.7068	$< 10^{-4}$
388	0.0000	0.0120		
390	0.0359	0.0558	0.4287	$< 10^{-4}$
396	0.0000	0.0159		
401	43.6693	105.7291	0.7828	$< 10^{-4}$
421	0.0359	0.1753	$\|x\| < 10^{-4}$	0.5878
425	0.0040	0.0120	$\|x\| < 10^{-4}$	0.9286
428	1.5538	7.7092	0.6324	$< 10^{-4}$
429	0.8207	0.6454	0.5320	$< 10^{-4}$
435	0.2869	1.2191	0.6480	$< 10^{-4}$
437	0.0040	0.0000		
439	0.2510	1.1713	0.7661	$< 10^{-4}$
444	0.0080	0.0359	0.7078	$< 10^{-4}$
449	0.0080	0.0000		
451	0.0080	0.0000		
452	0.0000	0.0279		
457	0.0000	0.0478		
458	0.0080	0.0040	$\|x\| < 10^{-4}$	0.9496

459	0.0159	0.0000		
461	0.0239	0.1315	$\lvert x \rvert < 10^{-4}$	0.8569
462	0.0040	0.0000		
465	0.0080	0.0080	1.0000	$< 10^{-4}$
471	0.0000	0.0518		
489	0.0199	0.0916	0.1592	0.0112
490	0.0040	0.0080	$\lvert x \rvert < 10^{-4}$	0.9286
492	0.0040	0.0000		
501	0.0837	0.0438	0.1588	0.0115
502	6.7968	11.9044	0.5900	$< 10^{-4}$
503	376.6335	316.3984	0.7953	$< 10^{-4}$
504	0.0080	0.0359	0.3456	$< 10^{-4}$
506	0.0040	0.1394	0.2120	0.0007
508	0.0000	0.0040		
509	0.0000	0.1514		
510	0.0000	0.0040		
511	0.0000	0.0040		
512	0.4263	0.5936	0.5180	$< 10^{-4}$
526	0.0000	0.0199		
530	0.0000	0.0199		
538	0.0000	0.0040		
541	0.0000	0.0080		
546	0.0000	0.0120		
552	0.0040	0.0080	$\lvert x \rvert < 10^{-4}$	0.9496
556	0.0040	0.0000		
557	0.0040	0.0000		
563	0.0120	0.0080	0.4025	$< 10^{-4}$
567	0.0120	0.0080	$\lvert x \rvert < 10^{-4}$	0.8761

568	0.0080	0.0040	$\lvert x \rvert < 10^{-4}$	0.9286
570	0.0120	0.0159	0.3275	$< 10^{-4}$
573	0.4781	0.1155	0.5147	$< 10^{-4}$
579	0.0040	0.0000		
596	0.0120	0.0000		
599	0.0279	0.0000		
604	0.0040	0.0000		
616	0.0000	0.0080		
617	0.0000	0.0040		
625	0.0040	0.0040	$\lvert x \rvert < 10^{-4}$	0.9496
627	0.0518	0.0000		
631	0.0000	0.0040		
640	0.6574	0.3307	0.6780	$< 10^{-4}$
646	0.0319	0.0000		
648	0.0000	0.0040		
651	0.7291	3.8247	0.7696	$< 10^{-4}$
652	3.4104	6.1155	0.7489	$< 10^{-4}$
654	0.0040	0.0000		
657	0.0080	0.0558	$\lvert x \rvert < 10^{-4}$	0.8103
659	0.1394	0.0199	0.4603	$< 10^{-4}$
694	0.0598	0.1275	0.3316	$< 10^{-4}$
700	0.0040	0.0000		
726	0.0159	0.0120	1.0000	$< 10^{-4}$
735	0.0040	0.0000		
744	0.0120	0.0000		
745	0.4980	0.5179	0.6140	$< 10^{-4}$
749	0.0000	0.0120		
754	0.0040	0.0000		
759	0.0637	0.0598	0.1874	0.0029

762	0.0438	0.0000		
764	0.0080	0.0000		
766	0.0040	0.0000		
768	0.0000	0.0040		
769	0.0080	0.0000		
773	0.0040	0.0398	$\|x\|<10^{-4}$	0.9124
786	0.0040	0.0000		
789	0.0000	0.0040		
793	0.0518	0.2351	0.7534	$<10^{-4}$
794	0.0757	0.0000		
795	0.1474	1.0159	0.3436	$<10^{-4}$
820	0.0159	0.1554	0.3736	$<10^{-4}$
830	0.0000	0.0398		
832	0.0080	0.0000		
833	0.0159	0.0000		
843	0.0080	0.0000		
849	0.0000	0.0040		
852	0.7291	0.2470	0.5785	$<10^{-4}$
856	0.0040	0.0000		
857	0.0000	0.0080		
858	0.0000	0.0797		
860	0.0000	0.0040		
861	0.0000	0.0120		
862	0.0000	0.0040		
865	22.7092	0.9084	0.2339	0.0002
866	0.0120	0.0040	$\|x\|<10^{-4}$	0.9286
869	0.0040	0.0000		
873	0.0000	0.0080		
876	0.0000	0.0159		
878	0.0000	0.0080		

896	0.0797	0.0359	0.7000	$< 10^{-4}$
910	0.0000	0.0120		
950	0.0000	0.0040		

Table 19. Species code, vessel-specific mean catches (counts) and correlation estimate (Kendall's τ) and corresponding p-value for species with some catch on either vessel at stations within the site-specific set. Correlation is inestimable when there was no catch by one of the vessels.

SVSPP	Mean Albatross Catch/Tow (Count)	Mean Bigelow Catch/Tow (Count)	Correlation	p-value
1	0.0923	0.1692	0.3126	$< 10^{-4}$
13	0.4564	0.4256	0.7231	$< 10^{-4}$
14	0.0821	0.4821	0.8415	$< 10^{-4}$
15	67.9231	78.6154	0.8024	$< 10^{-4}$
21	0.0205	0.0000		
22	0.2923	1.3949	0.5466	$< 10^{-4}$
23	4.3590	13.7077	0.6551	$< 10^{-4}$
24	0.0051	0.0000		
26	7.8513	46.0718	0.6490	$< 10^{-4}$
27	0.3744	2.4615	0.6158	$< 10^{-4}$
28	0.8154	2.8308	0.6531	$< 10^{-4}$
30	0.0564	0.0000		
31	0.0205	0.0051	1.0000	$< 10^{-4}$
32	13.6564	109.5487	0.6125	$< 10^{-4}$
33	2.8513	2.7692	0.3475	$< 10^{-4}$
34	1.8359	4.8256	0.3198	$< 10^{-4}$
35	0.2154	0.4872	0.1591	0.0215
36	0.0103	0.0000		

43	22.0513	0.0103	$\lvert x \rvert < 10^{-4}$	0.8362
46	0.0000	0.4154		
56	0.3282	0.0051	0.4111	$< 10^{-4}$
60	0.0103	0.0051	$\lvert x \rvert < 10^{-4}$	0.9189
72	48.4256	242.6513	0.6439	$< 10^{-4}$
73	2.0872	4.3641	0.6263	$< 10^{-4}$
74	49.5538	72.6615	0.8641	$< 10^{-4}$
75	0.4718	11.1641	0.3753	$< 10^{-4}$
76	2.3282	4.8103	0.6517	$< 10^{-4}$
77	11.9692	38.0103	0.6269	$< 10^{-4}$
78	2.4308	4.9641	0.6343	$< 10^{-4}$
79	0.0051	0.0615	0.3621	$< 10^{-4}$
83	0.0564	0.4154	0.3399	$< 10^{-4}$
84	0.0103	0.0821	0.2437	0.0007
87	0.0821	0.0718	$\lvert x \rvert < 10^{-4}$	0.8593
101	0.0256	0.0513	$\lvert x \rvert < 10^{-4}$	0.8593
102	6.3128	12.8410	0.8368	$< 10^{-4}$
103	1.5436	2.0462	0.6988	$< 10^{-4}$
104	5.5744	16.4359	0.7435	$< 10^{-4}$
105	5.4000	10.3333	0.7821	$< 10^{-4}$
106	1.5333	4.4000	0.7320	$< 10^{-4}$
107	0.3179	1.2359	0.4363	$< 10^{-4}$
108	0.6821	1.2051	0.7072	$< 10^{-4}$
109	5.4205	72.4974	0.6928	$< 10^{-4}$
111	0.0000	0.0000		
112	0.0154	0.0718	0.7080	$< 10^{-4}$
113	0.0103	0.0000		

116	0.0103	0.0000		
117	0.0359	0.2051	0.4056	$< 10^{-4}$
121	5.4308	3.5231	0.5073	$< 10^{-4}$
131	130.0154	73.3692	0.6657	$< 10^{-4}$
132	0.0000	0.0103		
135	0.1231	0.0667	0.4233	$< 10^{-4}$
139	0.2000	0.0615	0.2621	0.0002
141	0.3897	1.3538	0.4645	$< 10^{-4}$
143	23.1641	42.1333	0.7391	$< 10^{-4}$
151	0.0051	0.0359	0.4977	$< 10^{-4}$
155	42.1538	50.2872	0.8476	$< 10^{-4}$
156	0.0667	0.1333	0.5110	$< 10^{-4}$
158	0.0000	0.0718		
159	0.0051	0.2000	0.4077	$< 10^{-4}$
161	0.0872	1.2256	0.5799	$< 10^{-4}$
163	5.1949	20.4256	0.7645	$< 10^{-4}$
164	0.6410	1.3282	0.3711	$< 10^{-4}$
165	0.0615	1.3949	0.3436	$< 10^{-4}$
168	0.0154	0.0154	$\lvert x \rvert < 10^{-4}$	0.8277
171	1.5231	7.7949	0.6753	$< 10^{-4}$
172	0.0923	0.2103	0.6221	$< 10^{-4}$
173	0.0000	0.0051		
176	0.0667	0.2000	0.3659	$< 10^{-4}$
177	0.0256	0.0000		
180	0.0051	0.0000		
181	22.6051	79.4923	0.3366	$< 10^{-4}$
183	0.0051	0.0000		
190	0.0000	0.0051		

191	0.0154	0.0051	$\lvert x \rvert < 10^{-4}$	0.9005
192	0.0205	0.0872	0.4912	$< 10^{-4}$
193	0.6615	3.6615	0.4500	$< 10^{-4}$
194	0.3333	0.6667	0.7740	$< 10^{-4}$
196	0.0103	0.0103	0.7053	$< 10^{-4}$
197	0.2769	1.8359	0.2951	$< 10^{-4}$
205	0.0000	0.0564		
211	0.0256	0.0000		
212	0.3026	0.0000		
229	0.1692	0.2205	0.3788	$< 10^{-4}$
242	0.0000	0.0051		
249	0.0000	0.0103		
301	0.5487	0.8718	0.2755	$< 10^{-4}$
310	0.0000	0.0154		
312	0.1590	0.5949	0.2450	0.0004
313	0.2205	1.3538	0.4602	$< 10^{-4}$
316	0.0000	0.0256		
317	0.0410	0.0205	$\lvert x \rvert < 10^{-4}$	0.7369
319	0.0000	0.0564		
320	0.0000	0.0051		
324	0.0205	0.0410	0.1652	0.0211
325	0.0000	0.0154		
380	0.0051	0.0000		
390	0.0000	0.0718		
401	5.8769	29.7949	0.6177	$< 10^{-4}$
435	0.0051	0.0000		
452	0.0000	0.0051		
502	16.3487	17.6256	0.4910	$< 10^{-4}$
503	260.0103	347.4103	0.7770	$< 10^{-4}$

506	0.0205	0.2154	$\lvert x \rvert < 10^{-4}$	0.5338
511	0.0000	0.0051		
512	0.0513	0.4205	0.0526	0.4506
517	0.0000	0.0256		
604	0.0154	0.0359	0.6563	$< 10^{-4}$
616	0.0103	0.0000		
735	0.0000	0.1231		
795	0.1231	0.0769	$\lvert x \rvert < 10^{-4}$	0.8849
820	0.0000	0.0051		

Table 20. Pearson statistics (χ^2), degrees of freedom and p-values for models where the calibration factor is constant across all stations (1), differs between survey and site-specific stations (2) and differs also between spring and fall survey stations (3), by species (SVSPP code). Fit was not possible where values are missing.

SVSPP	χ_1^2	df_1	p-value	χ_2^2	df_2	p-value	χ_3^2	df_3	p-value
1	96.604	55	$< 10^{-3}$	96.376	54	$< 10^{-3}$	91.93	53	0.001
2									
3	$< 10^{-3}$	3	1	$< 10^{-3}$	3	1	$< 10^{-3}$	3	1
4	40.3	24	0.02	40.3	24	0.02	40.254	23	0.014
7									
9	12	6	0.062	12	6	0.062	5	5	0.416
12	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
13	276.44	95	$< 10^{-3}$	275.755	94	$< 10^{-3}$	274.863	93	$< 10^{-3}$
14	135.999	43	$< 10^{-3}$	137.274	42	$< 10^{-3}$	136.306	41	$< 10^{-3}$
15	8438.133	432	$< 10^{-3}$	8225.917	431	$< 10^{-3}$	8226.246	430	$< 10^{-3}$
16	34.995	23	0.052	34.995	23	0.052	35.032	22	0.038

18	65.842	26	$< 10^{-3}$	65.842	26	$< 10^{-3}$	64.18	25	$< 10^{-3}$
19	43.703	23	0.006	43.703	23	0.006	43.675	22	0.004
21	10	9	0.35	6	8	0.647	6	7	0.54
22	298.301	169	$< 10^{-3}$	290.471	168	$< 10^{-3}$	272.65	167	$< 10^{-3}$
23	2000.41	291	$< 10^{-3}$	1995.686	290	$< 10^{-3}$	1994.656	289	$< 10^{-3}$
24	152.925	101	0.001	147.172	100	0.002	142.342	99	0.003
25	74.351	32	$< 10^{-3}$	74.351	32	$< 10^{-3}$	65.622	31	$< 10^{-3}$
26	3645.53	391	$< 10^{-3}$	3545.796	390	$< 10^{-3}$	2751.042	389	$< 10^{-3}$
27	379.931	130	$< 10^{-3}$	309.628	129	$< 10^{-3}$	282.997	128	$< 10^{-3}$
28	277.949	114	$< 10^{-3}$	275.1	113	$< 10^{-3}$	275.411	112	$< 10^{-3}$
29	7.875	7	0.344	7.875	7	0.344	3	6	0.809
30	$< 10^{-3}$	3	1	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1
31	83192.639	58	$< 10^{-3}$	83191.193	57	$< 10^{-3}$	83186.073	56	$< 10^{-3}$
32	26061.294	305	$< 10^{-3}$	23549.922	304	$< 10^{-3}$	24339.587	303	$< 10^{-3}$
33	2190.522	169	$< 10^{-3}$	2022.513	168	$< 10^{-3}$	2024.969	167	$< 10^{-3}$
34	1848.233	115	$< 10^{-3}$	1677.303	114	$< 10^{-3}$	1667.301	113	$< 10^{-3}$
35	225.657	91	$< 10^{-3}$	228.549	90	$< 10^{-3}$	226.741	89	$< 10^{-3}$
36	71.91	17	$< 10^{-3}$	67.313	16	$< 10^{-3}$	49.785	15	$< 10^{-3}$
43	27613.313	54	$< 10^{-3}$	31236.506	53	$< 10^{-3}$	23423.574	52	$< 10^{-3}$
44	9161.84	49	$< 10^{-3}$	9161.84	49	$< 10^{-3}$	8958	48	$< 10^{-3}$
46	197.99	18	$< 10^{-3}$	116.072	17	$< 10^{-3}$	106.478	16	$< 10^{-3}$
56	704.067	35	$< 10^{-3}$	673.535	34	$< 10^{-3}$	609.192	33	$< 10^{-3}$
60	16	11	0.141	16	10	0.1	3	9	0.964
63									
65	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1
66									
67									
69	17.927	11	0.083	17.927	11	0.083	17.042	10	0.073

72	19828.498	498	$< 10^{-3}$	18327.911	497	$< 10^{-3}$	17797.58	496	$< 10^{-3}$
73	586.431	168	$< 10^{-3}$	579.719	167	$< 10^{-3}$	559.861	166	$< 10^{-3}$
74	3082.248	206	$< 10^{-3}$	3052.61	205	$< 10^{-3}$	2810.314	204	$< 10^{-3}$
75	1683.217	72	$< 10^{-3}$	1327.236	71	$< 10^{-3}$	1327.254	70	$< 10^{-3}$
76	564.113	199	$< 10^{-3}$	564.063	198	$< 10^{-3}$	559.429	197	$< 10^{-3}$
77	3169.155	395	$< 10^{-3}$	3152.517	394	$< 10^{-3}$	3131.217	393	$< 10^{-3}$
78	3669.174	265	$< 10^{-3}$	3597.615	264	$< 10^{-3}$	3498.908	263	$< 10^{-3}$
79	103.437	27	$< 10^{-3}$	103.438	26	$< 10^{-3}$	112.524	25	$< 10^{-3}$
83	93.527	70	0.032	92.583	69	0.031	99.617	68	0.007
84	27.924	23	0.219	26.558	22	0.228	24.951	21	0.249
87	122	19	$< 10^{-3}$	122	18	$< 10^{-3}$	113	17	$< 10^{-3}$
90	68.018	18	$< 10^{-3}$	68.018	18	$< 10^{-3}$	65.917	17	$< 10^{-3}$
91	11.259	6	0.081	11.259	6	0.081	11.259	6	0.081
99	8.444	7	0.295	8.444	7	0.295	6.556	6	0.364
101	34.404	21	0.033	34.415	20	0.023	33.621	19	0.02
102	476.392	208	$< 10^{-3}$	473.431	207	$< 10^{-3}$	472.61	206	$< 10^{-3}$
103	359.448	211	$< 10^{-3}$	317.785	210	$< 10^{-3}$	312.274	209	$< 10^{-3}$
104	1045.414	313	$< 10^{-3}$	1039.5	312	$< 10^{-3}$	1012.401	311	$< 10^{-3}$
105	1223.931	202	$< 10^{-3}$	1208.361	201	$< 10^{-3}$	1182.781	200	$< 10^{-3}$
106	835.128	183	$< 10^{-3}$	815.344	182	$< 10^{-3}$	774.103	181	$< 10^{-3}$
107	329.152	176	$< 10^{-3}$	334.659	175	$< 10^{-3}$	328.76	174	$< 10^{-3}$
108	315.833	196	$< 10^{-3}$	311.534	195	$< 10^{-3}$	298.998	194	$< 10^{-3}$
109	4081.08	233	$< 10^{-3}$	3513.821	232	$< 10^{-3}$	3202.809	231	$< 10^{-3}$
111	5	3	0.172	5	3	0.172	3	2	0.223
112	12.642	15	0.63	12.869	14	0.537	12.3	13	0.503
113	11.103	5	0.049	10.216	4	0.037	10.216	4	0.037
114	28.189	6	$< 10^{-3}$	28.189	6	$< 10^{-3}$	$< 10^{-3}$	5	1
115	1.333	2	0.513	1.333	2	0.513	1.333	2	0.513

116	4	3	0.261	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1
117	361.189	54	$< 10^{-3}$	354.403	53	$< 10^{-3}$	349.263	52	$< 10^{-3}$
118									
120	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1			
121	6071.332	136	$< 10^{-3}$	5252.101	135	$< 10^{-3}$	4940.281	134	$< 10^{-3}$
124	304.522	8	$< 10^{-3}$	304.522	8	$< 10^{-3}$	304.522	8	$< 10^{-3}$
126	53.547	13	$< 10^{-3}$	53.547	13	$< 10^{-3}$	51.961	12	$< 10^{-3}$
127	5	1	0.025	5	1	0.025			
129	169.304	27	$< 10^{-3}$	169.304	27	$< 10^{-3}$	169.304	27	$< 10^{-3}$
131	69746.255	386	$< 10^{-3}$	61038.763	385	$< 10^{-3}$	60799.583	384	$< 10^{-3}$
132	55.468	35	0.015	52.807	34	0.021	52.807	34	0.021
133	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1
134									
135	699.195	96	$< 10^{-3}$	694.947	95	$< 10^{-3}$	691.144	94	$< 10^{-3}$
136	12449.17	52	$< 10^{-3}$	12449.17	52	$< 10^{-3}$	11440.32	51	$< 10^{-3}$
137	5	2	0.082	5	2	0.082	5	2	0.082
139	53.368	27	0.002	53.48	26	0.001	53.402	25	0.001
141	439.34	127	$< 10^{-3}$	439.637	126	$< 10^{-3}$	440.452	125	$< 10^{-3}$
142	94.319	16	$< 10^{-3}$	94.319	16	$< 10^{-3}$	94.638	15	$< 10^{-3}$
143	13812.288	151	$< 10^{-3}$	13809.742	150	$< 10^{-3}$	13734.673	149	$< 10^{-3}$
145	3855.54	55	$< 10^{-3}$	3855.54	55	$< 10^{-3}$	1609.882	54	$< 10^{-3}$
146	69.994	24	$< 10^{-3}$	69.994	24	$< 10^{-3}$	44.687	23	0.004
148	3.6	3	0.308	3.6	3	0.308	0.917	2	0.632
149	12598.487	57	$< 10^{-3}$	12598.487	57	$< 10^{-3}$	10893.39	56	$< 10^{-3}$
151	7.2	5	0.206	5.905	4	0.206	5.905	4	0.206
154	5	1	0.025	5	1	0.025	5	1	0.025
155	9880.919	142	$< 10^{-3}$	9777.169	141	$< 10^{-3}$	9746.724	140	$< 10^{-3}$
156	319.077	64	$< 10^{-3}$	316.438	63	$< 10^{-3}$	301.032	62	$< 10^{-3}$

158	20.346	11	0.041	15.816	10	0.105	15.054	9	0.089
159	39.615	14	$< 10^{-3}$	19.755	13	0.101	19.755	13	0.101
160	18	2	$< 10^{-3}$	18	2	$< 10^{-3}$	18	2	$< 10^{-3}$
161	113.146	32	$< 10^{-3}$	130.593	31	$< 10^{-3}$	131.024	30	$< 10^{-3}$
163	979.994	232	$< 10^{-3}$	977.044	231	$< 10^{-3}$	975.249	230	$< 10^{-3}$
164	334.031	220	$< 10^{-3}$	335.356	219	$< 10^{-3}$	329.243	218	$< 10^{-3}$
165	240.72	61	$< 10^{-3}$	186.473	60	$< 10^{-3}$	178.414	59	$< 10^{-3}$
166	$< 10^{-3}$	7	1	$< 10^{-3}$	7	1	$< 10^{-3}$	7	1
168	36.78	31	0.219	35.873	30	0.212	32.099	29	0.316
170	67	10	$< 10^{-3}$	67	10	$< 10^{-3}$	$< 10^{-3}$	9	1
171	1458.659	183	$< 10^{-3}$	1431.149	182	$< 10^{-3}$	1401.417	181	$< 10^{-3}$
172	344.439	65	$< 10^{-3}$	344.574	64	$< 10^{-3}$	293.617	63	$< 10^{-3}$
173	53.779	18	$< 10^{-3}$	53.152	17	$< 10^{-3}$	56.75	16	$< 10^{-3}$
174	403.335	23	$< 10^{-3}$	403.335	23	$< 10^{-3}$	565.542	22	$< 10^{-3}$
175	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
176	44.128	22	0.003	44.104	21	0.002	40.72	20	0.004
177	9.26	6	0.159	1.071	5	0.957	0.735	4	0.947
179	18	13	0.158	18	13	0.158	14.936	12	0.245
180	4	3	0.261	3	2	0.223	2	1	0.157
181	15907.991	137	$< 10^{-3}$	14697.432	136	$< 10^{-3}$	14638.856	135	$< 10^{-3}$
183	$< 10^{-3}$	3	1	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1
184	4	2	0.135	4	2	0.135	3	1	0.083
186	0.75	1	0.386	0.75	1	0.386	0.75	1	0.386
187	2.593	4	0.628	2.593	4	0.628	2.593	4	0.628
188	30.781	18	0.031	30.781	18	0.031	24.655	17	0.103
190	2	1	0.157						
191	29.792	18	0.04	27.585	17	0.05	30.306	16	0.016
192	23.403	18	0.176	19.732	17	0.288	16.732	16	0.403

193	519.838	245	$< 10^{-3}$	515.081	244	$< 10^{-3}$	491.234	243	$< 10^{-3}$
194	235.754	45	$< 10^{-3}$	233.27	44	$< 10^{-3}$	197.226	43	$< 10^{-3}$
195									
196	29.872	33	0.624	27.468	32	0.695	28.273	31	0.607
197	349.998	293	0.012	350.14	292	0.011	346.759	291	0.014
198	10.145	11	0.517	10.145	11	0.517	10.145	11	0.517
199									
201	36.256	18	0.007	36.256	18	0.007	36.111	17	0.004
202	23	13	0.042	23	13	0.042	21	12	0.05
203	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
204	38	9	$< 10^{-3}$	38	9	$< 10^{-3}$	38	9	$< 10^{-3}$
205	116	14	$< 10^{-3}$	105	13	$< 10^{-3}$	105	13	$< 10^{-3}$
206									
208	7	2	0.03	7	2	0.03	5	1	0.025
209	301.412	24	$< 10^{-3}$	301.412	24	$< 10^{-3}$	301.412	24	$< 10^{-3}$
211	1253.417	32	$< 10^{-3}$	1247.984	31	$< 10^{-3}$	1246.896	30	$< 10^{-3}$
212	259.634	44	$< 10^{-3}$	182.922	43	$< 10^{-3}$	166.04	42	$< 10^{-3}$
213	7	2	0.03	7	2	0.03	7	2	0.03
221	81.526	28	$< 10^{-3}$	81.526	28	$< 10^{-3}$	81.423	27	$< 10^{-3}$
228									
229	932.209	25	$< 10^{-3}$	951.354	24	$< 10^{-3}$	413.769	23	$< 10^{-3}$
232	133.587	13	$< 10^{-3}$	133.587	13	$< 10^{-3}$	133.085	12	$< 10^{-3}$
239	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
240									
242	80.964	6	$< 10^{-3}$	79.97	5	$< 10^{-3}$	40.301	4	$< 10^{-3}$
246	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
249									
252	8.711	2	0.013	8.711	2	0.013	8.711	2	0.013
262	3.562	4	0.469	3.562	4	0.469	3.36	3	0.339

263	61.837	11	$< 10^{-3}$	61.837	11	$< 10^{-3}$	43.062	10	$< 10^{-3}$
270	43.379	7	$< 10^{-3}$	43.379	7	$< 10^{-3}$	43.379	7	$< 10^{-3}$
301	416.314	258	$< 10^{-3}$	416.883	257	$< 10^{-3}$	408.233	256	$< 10^{-3}$
302	0.311	1	0.577	0.311	1	0.577	0.311	1	0.577
305	730	4	$< 10^{-3}$	730	4	$< 10^{-3}$	730	4	$< 10^{-3}$
307	782.815	47	$< 10^{-3}$	782.815	47	$< 10^{-3}$	675.747	46	$< 10^{-3}$
310	22.916	15	0.086	21.525	14	0.089	21.407	13	0.065
311	106	6	$< 10^{-3}$	106	6	$< 10^{-3}$	5	5	0.416
312	267.672	146	$< 10^{-3}$	268.568	145	$< 10^{-3}$	270.567	144	$< 10^{-3}$
313	732.208	205	$< 10^{-3}$	729.584	204	$< 10^{-3}$	729.722	203	$< 10^{-3}$
314	16	11	0.141	16	11	0.141	16	11	0.141
316	309.424	19	$< 10^{-3}$	307.586	18	$< 10^{-3}$	469.146	17	$< 10^{-3}$
317	127.301	61	$< 10^{-3}$	120.166	60	$< 10^{-3}$	107.917	59	$< 10^{-3}$
318	77.994	46	0.002	77.994	46	0.002	81.615	45	0.001
319	336.45	25	$< 10^{-3}$	332.911	24	$< 10^{-3}$	292.915	23	$< 10^{-3}$
320	258.308	35	$< 10^{-3}$	258.087	34	$< 10^{-3}$	591.452	33	$< 10^{-3}$
321	144.965	22	$< 10^{-3}$	144.965	22	$< 10^{-3}$	130.635	21	$< 10^{-3}$
322	196.532	54	$< 10^{-3}$	196.532	54	$< 10^{-3}$	194.043	53	$< 10^{-3}$
323	18	9	0.035	18	9	0.035	13	8	0.112
324	22.349	18	0.217	22.3	17	0.173	20.705	16	0.19
325	29	9	0.001	26	8	0.001	18	7	0.012
327									
339	2	1	0.157	2	1	0.157	2	1	0.157
360	21.667	17	0.198	21.667	17	0.198	19.009	16	0.268
364									
375	32.148	19	0.03	32.148	19	0.03	28.427	18	0.056
376	26.238	11	0.006	26.238	11	0.006	25.681	10	0.004
378	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
380	6	2	0.05	5	1	0.025	5	1	0.025

384									
388	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1			
390	33.778	30	0.29	22.323	29	0.807	22.804	28	0.743
396	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
401	19805.17	314	$< 10^{-3}$	19755.5	313	$< 10^{-3}$	19126.509	312	$< 10^{-3}$
421	63	29	$< 10^{-3}$	63	29	$< 10^{-3}$	63	28	$< 10^{-3}$
425	7	5	0.221	7	5	0.221	7	4	0.136
428	976.015	30	$< 10^{-3}$	976.015	30	$< 10^{-3}$	976.015	30	$< 10^{-3}$
429	213.691	15	$< 10^{-3}$	213.691	15	$< 10^{-3}$	213.691	15	$< 10^{-3}$
435	163.539	36	$< 10^{-3}$	160.833	35	$< 10^{-3}$	148.967	34	$< 10^{-3}$
437	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1			
438									
439	18.05	9	0.035	18.05	9	0.035	17.282	8	0.027
444	0.244	1	0.621	0.244	1	0.621	0.244	1	0.621
446									
449	5	2	0.082	5	2	0.082	0.278	1	0.598
451	8	2	0.018	8	2	0.018	$< 10^{-3}$	1	1
452	$< 10^{-3}$	4	1	$< 10^{-3}$	3	1	$< 10^{-3}$	3	1
457	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1			
458	3	1	0.083	3	1	0.083	3	1	0.083
459	5	2	0.082	5	2	0.082	$< 10^{-3}$	1	1
461	41	7	$< 10^{-3}$	41	7	$< 10^{-3}$	41	6	$< 10^{-3}$
462									
465	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
471	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
489	26.183	15	0.036	26.183	15	0.036	26.146	14	0.025
490	5	3	0.172	5	3	0.172	3	2	0.223
492									

501	45.17	11	$< 10^{-3}$	45.17	11	$< 10^{-3}$	29.784	10	0.001
502	4949.499	331	$< 10^{-3}$	4825.26	330	$< 10^{-3}$	4815.348	329	$< 10^{-3}$
503	72363.507	421	$< 10^{-3}$	71017.381	420	$< 10^{-3}$	67451.348	419	$< 10^{-3}$
504	26.969	7	$< 10^{-3}$	26.969	7	$< 10^{-3}$	21.86	6	0.001
506	169.91	76	$< 10^{-3}$	135.75	75	$< 10^{-3}$	140.935	74	$< 10^{-3}$
508									
509	$< 10^{-3}$	4	1	$< 10^{-3}$	4	1	$< 10^{-3}$	3	1
510	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1	$< 10^{-3}$	1	1
511	$< 10^{-3}$	1	1						
512	231.145	105	$< 10^{-3}$	232.068	104	$< 10^{-3}$	232.119	103	$< 10^{-3}$
516	11	1	0.001	11	1	0.001	11	1	0.001
517	6	3	0.112	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1
526									
527									
530	1.905	3	0.592	1.905	3	0.592	$< 10^{-3}$	2	1
538									
541	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
546	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
551									
552	3	1	0.083	3	1	0.083	3	1	0.083
556									
557									
563	2.917	3	0.405	2.917	3	0.405	2.917	3	0.405
564									
567	5	4	0.287	5	4	0.287	5	4	0.287
568	3	2	0.223	3	2	0.223	3	2	0.223
570	4.278	4	0.37	4.278	4	0.37	4.278	4	0.37
573	32.215	5	$< 10^{-3}$	32.215	5	$< 10^{-3}$	32.215	5	$< 10^{-3}$
579									

596	4	2	0.135	4	2	0.135	$< 10^{-3}$	1	1
599	$< 10^{-3}$	4	1	$< 10^{-3}$	4	1	$< 10^{-3}$	4	1
604	6.75	5	0.24	6.444	4	0.168	4.444	3	0.217
616	4	2	0.135	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
617									
621									
625	2	1	0.157	2	1	0.157	2	1	0.157
627	$< 10^{-3}$	3	1	$< 10^{-3}$	3	1	$< 10^{-3}$	3	1
631	5	3	0.172	5	3	0.172	4	2	0.135
640	820.876	20	$< 10^{-3}$	820.876	20	$< 10^{-3}$	469.69	19	$< 10^{-3}$
646	$< 10^{-3}$	3	1	$< 10^{-3}$	3	1	$< 10^{-3}$	3	1
648									
651	893.729	20	$< 10^{-3}$	893.729	20	$< 10^{-3}$	656.527	19	$< 10^{-3}$
652	613.91	31	$< 10^{-3}$	613.91	31	$< 10^{-3}$	607.332	30	$< 10^{-3}$
654									
657	16	8	0.042	16	8	0.042	16	8	0.042
659	19.769	7	0.006	19.769	7	0.006	19.683	6	0.003
694	34.268	17	0.008	34.268	17	0.008	34.268	17	0.008
700									
726	2.057	1	0.151	2.057	1	0.151			
735	25.49	7	0.001	5.76	6	0.451	4.587	5	0.468
739	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1
744	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1
745	77.683	15	$< 10^{-3}$	77.683	15	$< 10^{-3}$	77.683	15	$< 10^{-3}$
749									
754	6	1	0.014	6	1	0.014			
759	62.128	16	$< 10^{-3}$	62.128	16	$< 10^{-3}$	57.137	15	$< 10^{-3}$
760									
761	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1

762	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
763	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
764	13	3	0.005	13	3	0.005	$< 10^{-3}$	2	1
766									
768	26	3	$< 10^{-3}$	26	3	$< 10^{-3}$	25	2	$< 10^{-3}$
769	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1			
773	30	5	$< 10^{-3}$	30	5	$< 10^{-3}$	11	4	0.027
780									
786									
789									
793	30.612	11	0.001	30.612	11	0.001	66.237	10	$< 10^{-3}$
794									
795	235.281	37	$< 10^{-3}$	188.806	36	$< 10^{-3}$	186.301	35	$< 10^{-3}$
820	24.47	10	0.006	23.87	9	0.005	23.87	9	0.005
830	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1
832	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
833	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
843	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1			
849									
852	57.107	7	$< 10^{-3}$	57.107	7	$< 10^{-3}$	38.364	6	$< 10^{-3}$
856	6	1	0.014	6	1	0.014			
857	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1			
858									
860									
861	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1	$< 10^{-3}$	1	1
862									
865	5877.3	8	$< 10^{-3}$	5877.3	8	$< 10^{-3}$	5877.3	8	$< 10^{-3}$
866	9	3	0.029	9	3	0.029	4	2	0.135

869	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1	$< 10^{-3}$	2	1
873									
876									
878									
880									
896	13.81	6	0.032	13.81	6	0.032	13.114	5	0.022
910	6.423	2	0.04	6.423	2	0.04	$< 10^{-3}$	1	1
950	2.1	3	0.552	2.1	3	0.552	1.5	2	0.472

Table 21. Likelihood ratio test statistics comparing beta-binomial models in Table 3, by species (SVSPP code). Tests were not possible where values are missing. Species for which no tests were possible are omitted.

SVSPP	$M_{1,1}$ to $M_{2,1}$	$M_{1,1}$ to $M_{1,2}$	$M_{1,1}$ to $M_{3,1}$	$M_{1,1}$ to $M_{1,3}$	$M_{2,2}$ to $M_{3,2}$	$M_{2,2}$ to $M_{2,3}$
1	0.362	0.711	4.814	1.522	3.826	1.102
4	$< 10^{-3}$	$< 10^{-3}$	1.456	3.907	1.456	3.907
9	$< 10^{-3}$	$< 10^{-3}$	4.557	$< 10^{-3}$	4.557	$< 10^{-3}$
13	2.671	1.094	5.152	1.471	2.397	0.566
14	0.027	0.901	2.577	0.920	2.544	0.026
15	2.111	0.102	2.111	0.285	0.001	0.220
16	$< 10^{-3}$	$< 10^{-3}$	0.012	1.210	0.012	1.211
18	$< 10^{-3}$	$< 10^{-3}$	3.186	4.550	3.186	4.551
19	$< 10^{-3}$	$< 10^{-3}$	0.014	0.187	0.014	0.190
21	5.822	$< 10^{-3}$	5.822	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
22	0.506	4.138	2.402	5.152	1.513	0.788
23	0.222	0.016	2.857	12.553	2.635	12.367
24	4.090	$< 10^{-3}$	4.863	6.354	0.773	
25	$< 10^{-3}$	$< 10^{-3}$	0.362	10.543	0.362	10.544

26	1.555	0.047	12.222	3.606	10.559	2.632
27	0.757	6.093	7.074	6.526	4.529	0.078
28	0.301	1.785	2.319	2.645	2.311	0.597
29	$< 10^{-3}$	$< 10^{-3}$	4.558	0.726	4.558	0.726
31	0.170	1.051	1.384	1.154	1.202	0.097
32	1.263	0.192	5.829	37.510	4.580	36.766
33	4.147	40.085	5.633	40.337	3.100	0.064
34	2.252	17.292	2.351	17.865	0.159	0.680
35	0.868	9.276	0.908	9.306	0.073	0.046
36	2.929	0.438	4.969	1.741	2.040	1.553
43	6.042	9.084	6.102	16.266	0.077	7.011
44	$< 10^{-3}$	$< 10^{-3}$	12.189	4.407	12.184	4.403
46	2.146	0.280	10.075	2.749	7.930	2.247
56	9.286	3.562	12.710	4.208	3.262	1.024
60	0.715	$< 10^{-3}$	6.994	$< 10^{-3}$	6.279	$< 10^{-3}$
69	$< 10^{-3}$	$< 10^{-3}$	0.182	0.816	0.182	0.817
72	0.071	10.780	11.155	12.548	13.040	1.243
73	0.168	0.017	1.036	1.307	0.942	1.642
74	8.981	1.937	9.539	2.770	0.494	0.619
75	0.772	0.616	0.774	4.284	0.004	3.606
76	0.040	0.002	0.620	0.561	0.592	0.532
77	0.465	0.201	7.320	0.330	6.950	0.190
78	14.539	2.651	14.681	2.716	0.163	0.031
79	0.662	0.230	0.797	4.169	0.101	3.703
83	0.347	0.201	4.534	1.300	4.276	2.136
84	1.575	0.001	3.672	0.001		
87	0.268	$< 10^{-3}$	3.051	$< 10^{-3}$	2.783	$< 10^{-3}$
90	$< 10^{-3}$	$< 10^{-3}$	1.117	1.341	1.117	1.342
91	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
99	$< 10^{-3}$	$< 10^{-3}$	1.042	1.278	1.042	1.278

101	0.002	6.071	0.582	6.147	1.431	0.103
102	1.895	4.943	2.064	5.356	0.112	0.451
103	16.927	0.637	19.089	3.923	2.055	5.454
104	0.318	1.465	3.547	1.622	2.724	0.271
105	3.269	0.027	3.529	12.459	0.258	14.039
106	1.291	3.796	1.327	4.636	0.068	0.893
107	1.562	3.929	1.863	3.934	0.464	$<10^{-3}$
108	0.732	0.535	2.137	6.307	1.174	6.333
109	4.201	6.405	13.218	13.070	6.152	0.822
111	$<10^{-3}$	$<10^{-3}$				
112	0.271	0.001	1.013	0.001	0.741	$<10^{-3}$
113	0.868	0.389	0.868	0.390	$<10^{-3}$	$<10^{-3}$
114	$<10^{-3}$	$<10^{-3}$		0.457		0.457
116		$<10^{-3}$				
117	0.002	0.163	6.433	4.049	6.307	3.971
121	3.244	0.135	3.840	7.705	0.567	8.434
124	$<10^{-3}$	$<10^{-3}$	$<10^{-3}$	$<10^{-3}$	$<10^{-3}$	$<10^{-3}$
126	$<10^{-3}$	$<10^{-3}$	0.477	5.369	0.477	5.369
129	$<10^{-3}$	$<10^{-3}$	$<10^{-3}$	$<10^{-3}$	$<10^{-3}$	$<10^{-3}$
131	15.293	5.953	16.923	6.724	1.760	1.034
132	2.715	$<10^{-3}$	2.716	$<10^{-3}$	$<10^{-3}$	$<10^{-3}$
135	1.684	0.281	3.427	0.346	1.695	0.036
136	$<10^{-3}$	$<10^{-3}$	5.853	0.357	5.853	0.357
139	1.652	3.302	1.715	4.470	0.044	1.229
141	2.080	2.260	5.674	2.625	3.323	0.428
142	$<10^{-3}$	$<10^{-3}$	0.015	0.690	0.015	0.691
143	6.439	3.700	9.432	12.617	2.787	8.559
145	$<10^{-3}$	$<10^{-3}$	0.148	0.098	0.148	0.098
146	$<10^{-3}$	$<10^{-3}$	6.941	3.507	6.941	3.507

148	$< 10^{-3}$	$< 10^{-3}$				
149	$< 10^{-3}$	$< 10^{-3}$	1.180	2.624	1.180	2.624
151	0.286	0.805	0.286	0.805	$< 10^{-3}$	$< 10^{-3}$
155	0.564	0.462	0.659	0.698	0.085	0.244
156	0.885	0.086	2.614	4.659	1.805	4.212
158	2.325	1.818	2.694	2.423	0.369	0.624
159	2.230	0.008	2.230	0.008	$< 10^{-3}$	$< 10^{-3}$
161	2.485	2.598	3.584	2.884	1.428	0.278
163	1.185	7.681	1.813	7.681	0.975	0.003
164	0.002	0.478	2.699	0.492	3.113	0.012
165	11.934	0.370	17.491	6.799	5.283	4.625
168	1.697	$< 10^{-3}$	4.573	$< 10^{-3}$	2.876	$< 10^{-3}$
170	$< 10^{-3}$	$< 10^{-3}$		$< 10^{-3}$		$< 10^{-3}$
171	0.006	14.357	4.743	19.544	4.599	4.116
172	1.386	3.725	1.387	4.309	0.005	0.672
173	0.604	$< 10^{-3}$	0.887	11.494	0.284	11.601
174	$< 10^{-3}$	$< 10^{-3}$	10.261	3.784	10.261	3.783
176	3.382	$< 10^{-3}$	5.914	1.195	2.637	0.800
177	9.943	2.627	10.416	2.627		
179	$< 10^{-3}$	$< 10^{-3}$	3.306	0.377	3.306	0.377
180	0.679	$< 10^{-3}$				
181	7.396	2.592	10.716	5.715	5.130	2.084
187	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$		
188	$< 10^{-3}$	$< 10^{-3}$	2.396	$< 10^{-3}$	2.396	$< 10^{-3}$
191	5.245	$< 10^{-3}$	6.085	2.100	0.840	1.555
192	0.508	6.318	2.564	6.319	0.738	$< 10^{-3}$
193	0.080	2.253	1.762	2.516	1.061	0.118
194	0.891	0.702	3.402	0.702	2.294	0.031
196	1.748	0.001	1.943	0.001	0.195	0.001

197	0.260	0.154	0.779	2.948	0.570	2.603
198	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
201	$< 10^{-3}$	$< 10^{-3}$	0.044	$< 10^{-3}$	0.044	$< 10^{-3}$
202	$< 10^{-3}$	$< 10^{-3}$	3.386	$< 10^{-3}$	3.386	$< 10^{-3}$
204	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
205	0.646	$< 10^{-3}$	0.646	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
209	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
211	4.897	0.573	6.444	0.573	1.546	$< 10^{-3}$
212	16.981	4.133	32.366	5.997	15.385	2.355
221	$< 10^{-3}$	$< 10^{-3}$	1.922	0.572	1.922	0.572
229	7.297	2.766	7.533	4.817	0.100	5.737
232	$< 10^{-3}$	$< 10^{-3}$	0.319	0.018	0.319	0.018
242	2.238	$< 10^{-3}$	4.950	0.979	2.711	0.712
262	$< 10^{-3}$	$< 10^{-3}$	0.105	$< 10^{-3}$		
263	$< 10^{-3}$	$< 10^{-3}$	1.484	0.841	1.484	0.840
270	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
301	0.164	1.209	0.164	1.242	0.002	0.022
305	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$		
307	$< 10^{-3}$	$< 10^{-3}$	4.767	0.294	4.767	0.294
310	0.934	$< 10^{-3}$	0.934	0.990	0.002	1.077
311	$< 10^{-3}$	$< 10^{-3}$	4.557	$< 10^{-3}$	4.557	$< 10^{-3}$
312	1.549	3.249	1.549	9.349	0.003	6.245
313	2.771	0.123	5.236	1.272	2.397	1.458
314	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
316	0.526	0.304	1.254	4.164	0.729	3.869
317	8.553	0.874	10.871	1.367	2.515	0.903
318	$< 10^{-3}$	$< 10^{-3}$	0.116	0.212	0.116	0.212
319	2.997	1.127	3.011	9.847	0.013	7.919

320	0.261	$< 10^{-3}$	4.593	8.760	4.331	8.840
321	$< 10^{-3}$	$< 10^{-3}$	0.127	1.039	0.127	1.039
322	$< 10^{-3}$	$< 10^{-3}$	1.647	2.800	1.647	2.801
323	$< 10^{-3}$	$< 10^{-3}$	0.222	$< 10^{-3}$	0.223	$< 10^{-3}$
324	0.005	0.243	2.378	0.244	2.348	$< 10^{-3}$
325	0.473	$< 10^{-3}$	1.633	$< 10^{-3}$	1.159	$< 10^{-3}$
360	$< 10^{-3}$	$< 10^{-3}$	2.910	1.548	2.910	1.547
375	$< 10^{-3}$	$< 10^{-3}$	6.327	4.371	6.327	4.371
376	$< 10^{-3}$	$< 10^{-3}$	0.663	0.333	0.663	0.333
390	9.360	2.001	10.588	8.374	1.228	5.804
401	0.363	2.760	3.918	7.597	3.665	4.671
421	$< 10^{-3}$	$< 10^{-3}$	1.979	$< 10^{-3}$	1.979	$< 10^{-3}$
425	$< 10^{-3}$	$< 10^{-3}$	0.680	$< 10^{-3}$	0.680	$< 10^{-3}$
428	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
429	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
435	3.363	$< 10^{-3}$	7.451	1.254	4.090	1.417
439	$< 10^{-3}$	$< 10^{-3}$	1.991	1.605	1.992	1.606
461	$< 10^{-3}$	$< 10^{-3}$	0.174	$< 10^{-3}$	0.174	$< 10^{-3}$
489	$< 10^{-3}$	$< 10^{-3}$	4.679	1.442	4.679	1.441
490	$< 10^{-3}$	$< 10^{-3}$				
501	$< 10^{-3}$	$< 10^{-3}$	3.377	0.707	3.377	0.707
502	4.036	0.725	7.215	1.991	3.283	1.714
503	2.023	0.145	4.986	4.023	2.942	3.673
504	$< 10^{-3}$	$< 10^{-3}$	2.875	$< 10^{-3}$	2.875	$< 10^{-3}$
506	0.664	2.981	1.446	3.182	0.727	0.129
512	10.519	5.484	11.767	7.580	1.240	2.293
517		$< 10^{-3}$				
530	$< 10^{-3}$	$< 10^{-3}$				

563	$< 10^{-3}$	$< 10^{-3}$				
567	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$		
570	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$		
573	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
604	0.253	$< 10^{-3}$	3.025	$< 10^{-3}$	2.772	$< 10^{-3}$
631	$< 10^{-3}$	$< 10^{-3}$				
640	$< 10^{-3}$	$< 10^{-3}$	1.313	6.431	1.313	6.431
651	$< 10^{-3}$	$< 10^{-3}$	3.490	0.758	3.490	0.758
652	$< 10^{-3}$	$< 10^{-3}$	3.187	0.021	3.187	0.021
657	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
659	$< 10^{-3}$	$< 10^{-3}$	1.004	0.997	1.004	0.998
694	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
735	6.204	2.050	7.651	2.051	1.446	$< 10^{-3}$
745	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
759	$< 10^{-3}$	$< 10^{-3}$	0.377	0.002	0.377	0.002
764	$< 10^{-3}$	$< 10^{-3}$				
768	$< 10^{-3}$	$< 10^{-3}$				
773	$< 10^{-3}$	$< 10^{-3}$	0.908	$< 10^{-3}$	0.908	$< 10^{-3}$
793	$< 10^{-3}$	$< 10^{-3}$	3.873	8.977	3.873	8.976
795	5.825	2.365	10.752	4.811	5.003	2.594
820	0.310	$< 10^{-3}$	0.310	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
852	$< 10^{-3}$	$< 10^{-3}$	4.414	1.123	4.414	1.123
865	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$	$< 10^{-3}$
866	$< 10^{-3}$	$< 10^{-3}$				
896	$< 10^{-3}$	$< 10^{-3}$	0.593	$< 10^{-3}$	0.593	$< 10^{-3}$
950	$< 10^{-3}$	$< 10^{-3}$				

Table 22. P-values for likelihood ratio test statistics comparing beta-binomial models in Table 3, by species (SVSPP code). Tests were not possible where values are missing. Species for which no tests were possible are omitted.

SVSPP	$M_{1,1}$ to $M_{2,1}$	$M_{1,1}$ to $M_{1,2}$	$M_{1,1}$ to $M_{3,1}$	$M_{1,1}$ to $M_{1,3}$	$M_{2,2}$ to $M_{3,2}$	$M_{2,2}$ to $M_{2,3}$
1	0.5474	0.3991	0.0901	0.4672	0.0505	0.2938
4	1.0000	1.0000	0.4829	0.1418	0.2276	0.0481
9	1.0000	1.0000	0.1024	1.0000	0.0328	1.0000
13	0.1022	0.2956	0.0761	0.4793	0.1216	0.4519
14	0.8695	0.3425	0.2757	0.6313	0.1107	0.8719
15	0.1462	0.7494	0.3480	0.8672	0.9748	0.6390
16	1.0000	1.0000	0.9940	0.5461	0.9128	0.2711
18	1.0000	1.0000	0.2033	0.1028	0.0743	0.0329
19	1.0000	1.0000	0.9930	0.9107	0.9058	0.6629
21	0.0158	1.0000	0.0544	1.0000	1.0000	1.0000
22	0.4769	0.0419	0.3009	0.0761	0.2187	0.3747
23	0.6375	0.8993	0.2397	0.0019	0.1045	0.0004
24	0.0431	1.0000	0.0879	0.0417	0.3793	
25	1.0000	1.0000	0.8344	0.0051	0.5474	0.0012
26	0.2124	0.8284	0.0022	0.1648	0.0012	0.1047
27	0.3843	0.0136	0.0291	0.0383	0.0333	0.7800
28	0.5833	0.1815	0.3136	0.2665	0.1285	0.4397
29	1.0000	1.0000	0.1024	0.6956	0.0328	0.3942
31	0.6801	0.3053	0.5006	0.5616	0.2729	0.7555
32	0.2611	0.6613	0.0542	$< 10^{-4}$	0.0323	$< 10^{-4}$
33	0.0417	$< 10^{-4}$	0.0598	$< 10^{-4}$	0.0783	0.8003
34	0.1334	$< 10^{-4}$	0.3087	0.0001	0.6901	0.4096
35	0.3515	0.0023	0.6351	0.0095	0.7870	0.8302

36	0.0870	0.5081	0.0834	0.4187	0.1532	0.2127
43	0.0140	0.0026	0.0473	0.0003	0.7814	0.0081
44	1.0000	1.0000	0.0023	0.1104	0.0005	0.0359
46	0.1429	0.5967	0.0065	0.2530	0.0049	0.1339
56	0.0023	0.0591	0.0017	0.1220	0.0709	0.3116
60	0.3978	1.0000	0.0303	1.0000	0.0122	1.0000
69	1.0000	1.0000	0.9130	0.6650	0.6697	0.3661
72	0.7899	0.0010	0.0038	0.0019	0.0003	0.2649
73	0.6819	0.8963	0.5957	0.5202	0.3318	0.2001
74	0.0027	0.1640	0.0085	0.2503	0.4821	0.4314
75	0.3796	0.4325	0.6791	0.1174	0.9496	0.0576
76	0.8415	0.9643	0.7334	0.7554	0.4416	0.4658
77	0.4953	0.6539	0.0257	0.8479	0.0084	0.6629
78	0.0001	0.1035	0.0006	0.2572	0.6864	0.8602
79	0.4159	0.6315	0.6713	0.1244	0.7506	0.0543
83	0.5558	0.6539	0.1036	0.5220	0.0387	0.1439
84	0.2095	0.9748	0.1595	0.9995		
87	0.6047	1.0000	0.2175	1.0000	0.0953	1.0000
90	1.0000	1.0000	0.5721	0.5115	0.2906	0.2467
91	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
99	1.0000	1.0000	0.5939	0.5278	0.3074	0.2583
101	0.9643	0.0137	0.7475	0.0463	0.2316	0.7483
102	0.1686	0.0262	0.3563	0.0687	0.7379	0.5019
103	$< 10^{-4}$	0.4248	0.0001	0.1406	0.1517	0.0195
104	0.5728	0.2261	0.1697	0.4444	0.0989	0.6027
105	0.0706	0.8695	0.1713	0.0020	0.6115	0.0002
106	0.2559	0.0514	0.5150	0.0985	0.7943	0.3447
107	0.2114	0.0475	0.3940	0.1399	0.4958	1.0000
108	0.3922	0.4645	0.3435	0.0427	0.2786	0.0119
109	0.0404	0.0114	0.0013	0.0015	0.0131	0.3646
111	1.0000	1.0000				

112	0.6027	0.9748	0.6026	0.9995	0.3893	1.0000
113	0.3515	0.5328	0.6479	0.8228	1.0000	1.0000
114	1.0000	1.0000		0.7957		0.4990
116		1.0000				
117	0.9643	0.6864	0.0401	0.1321	0.0120	0.0463
121	0.0717	0.7133	0.1466	0.0212	0.4515	0.0037
124	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
126	1.0000	1.0000	0.7878	0.0683	0.4898	0.0205
129	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
131	0.0001	0.0147	0.0002	0.0347	0.1846	0.3092
132	0.0994	1.0000	0.2572	1.0000	1.0000	1.0000
135	0.1944	0.5960	0.1802	0.8411	0.1929	0.8495
136	1.0000	1.0000	0.0536	0.8365	0.0156	0.5502
139	0.1987	0.0692	0.4242	0.1070	0.8339	0.2676
141	0.1492	0.1328	0.0586	0.2691	0.0683	0.5130
142	1.0000	1.0000	0.9925	0.7082	0.9025	0.4058
143	0.0112	0.0544	0.0090	0.0018	0.0950	0.0034
145	1.0000	1.0000	0.9287	0.9522	0.7005	0.7542
146	1.0000	1.0000	0.0311	0.1732	0.0084	0.0611
148	1.0000	1.0000				
149	1.0000	1.0000	0.5543	0.2693	0.2774	0.1053
151	0.5928	0.3696	0.8668	0.6686	1.0000	1.0000
155	0.4527	0.4967	0.7193	0.7054	0.7706	0.6213
156	0.3468	0.7693	0.2706	0.0973	0.1791	0.0401
158	0.1273	0.1776	0.2600	0.2978	0.5435	0.4296
159	0.1354	0.9287	0.3279	0.9960	1.0000	1.0000
161	0.1149	0.1070	0.1666	0.2365	0.2321	0.5980
163	0.2763	0.0056	0.4039	0.0215	0.3234	0.9563
164	0.9643	0.4893	0.2594	0.7819	0.0777	0.9128
165	0.0006	0.5430	0.0002	0.0334	0.0215	0.0315
168	0.1927	1.0000	0.1016	1.0000	0.0899	1.0000

170	1.0000	1.0000		1.0000		1.0000
171	0.9383	0.0002	0.0933	0.0001	0.0320	0.0425
172	0.2391	0.0536	0.4998	0.1160	0.9436	0.4124
173	0.4371	1.0000	0.6418	0.0032	0.5941	0.0007
174	1.0000	1.0000	0.0059	0.1508	0.0014	0.0518
176	0.0659	1.0000	0.0520	0.5502	0.1044	0.3711
177	0.0016	0.1051	0.0055	0.2689		
179	1.0000	1.0000	0.1915	0.8282	0.0690	0.5392
180	0.4099	1.0000				
181	0.0065	0.1074	0.0047	0.0574	0.0235	0.1488
187	1.0000	1.0000	1.0000	1.0000		
188	1.0000	1.0000	0.3018	1.0000	0.1216	1.0000
191	0.0220	1.0000	0.0477	0.3499	0.3594	0.2124
192	0.4760	0.0120	0.2775	0.0424	0.3903	1.0000
193	0.7773	0.1334	0.4144	0.2842	0.3030	0.7312
194	0.3452	0.4021	0.1825	0.7040	0.1299	0.8602
196	0.1861	0.9748	0.3785	0.9995	0.6588	0.9748
197	0.6101	0.6947	0.6774	0.2290	0.4503	0.1067
198	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
201	1.0000	1.0000	0.9782	1.0000	0.8339	1.0000
202	1.0000	1.0000	0.1840	1.0000	0.0658	1.0000
204	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
205	0.4215	1.0000	0.7240	1.0000	1.0000	1.0000
209	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
211	0.0269	0.4491	0.0399	0.7509	0.2137	1.0000
212	$< 10^{-4}$	0.0421	$< 10^{-4}$	0.0499	0.0001	0.1249
221	1.0000	1.0000	0.3825	0.7513	0.1656	0.4495
229	0.0069	0.0963	0.0231	0.0900	0.7518	0.0166
232	1.0000	1.0000	0.8526	0.9910	0.5722	0.8933
242	0.1347	1.0000	0.0842	0.6129	0.0997	0.3988
262	1.0000	1.0000	0.9489	1.0000		

263	1.0000	1.0000	0.4762	0.6567	0.2231	0.3594
270	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
301	0.6855	0.2715	0.9213	0.5374	0.9643	0.8821
305	1.0000	1.0000	1.0000	1.0000		
307	1.0000	1.0000	0.0922	0.8633	0.0290	0.5877
310	0.3338	1.0000	0.6269	0.6096	0.9643	0.2994
311	1.0000	1.0000	0.1024	1.0000	0.0328	1.0000
312	0.2133	0.0715	0.4609	0.0093	0.9563	0.0125
313	0.0960	0.7258	0.0729	0.5294	0.1216	0.2272
314	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
316	0.4683	0.5814	0.5342	0.1247	0.3932	0.0492
317	0.0034	0.3499	0.0044	0.5048	0.1128	0.3420
318	1.0000	1.0000	0.9436	0.8994	0.7334	0.6452
319	0.0834	0.2884	0.2219	0.0073	0.9092	0.0049
320	0.6094	1.0000	0.1006	0.0125	0.0374	0.0029
321	1.0000	1.0000	0.9385	0.5948	0.7216	0.3081
322	1.0000	1.0000	0.4389	0.2466	0.1994	0.0942
323	1.0000	1.0000	0.8949	1.0000	0.6368	1.0000
324	0.9436	0.6220	0.3045	0.8851	0.1254	1.0000
325	0.4916	1.0000	0.4420	1.0000	0.2817	1.0000
360	1.0000	1.0000	0.2334	0.4612	0.0880	0.2136
375	1.0000	1.0000	0.0423	0.1124	0.0119	0.0366
376	1.0000	1.0000	0.7178	0.8466	0.4155	0.5639
390	0.0022	0.1572	0.0050	0.0152	0.2678	0.0160
401	0.5468	0.0966	0.1410	0.0224	0.0556	0.0307
421	1.0000	1.0000	0.3718	1.0000	0.1595	1.0000
425	1.0000	1.0000	0.7118	1.0000	0.4096	1.0000
428	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
429	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
435	0.0667	1.0000	0.0241	0.5342	0.0431	0.2339
439	1.0000	1.0000	0.3695	0.4482	0.1581	0.2051

461	1.0000	1.0000	0.9167	1.0000	0.6766	1.0000
489	1.0000	1.0000	0.0964	0.4863	0.0305	0.2300
490	1.0000	1.0000				
501	1.0000	1.0000	0.1848	0.7022	0.0661	0.4004
502	0.0445	0.3945	0.0271	0.3695	0.0700	0.1905
503	0.1549	0.7034	0.0827	0.1338	0.0863	0.0553
504	1.0000	1.0000	0.2375	1.0000	0.0900	1.0000
506	0.4152	0.0842	0.4853	0.2037	0.3939	0.7195
512	0.0012	0.0192	0.0028	0.0226	0.2655	0.1300
517		1.0000				
530	1.0000	1.0000				
563	1.0000	1.0000				
567	1.0000	1.0000	1.0000	1.0000		
570	1.0000	1.0000	1.0000	1.0000		
573	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
604	0.6150	1.0000	0.2204	1.0000	0.0959	1.0000
631	1.0000	1.0000				
640	1.0000	1.0000	0.5187	0.0401	0.2519	0.0112
651	1.0000	1.0000	0.1746	0.6845	0.0617	0.3840
652	1.0000	1.0000	0.2032	0.9896	0.0742	0.8848
657	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
659	1.0000	1.0000	0.6053	0.6074	0.3163	0.3178
694	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
735	0.0127	0.1522	0.0218	0.3586	0.2292	1.0000
745	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
759	1.0000	1.0000	0.8282	0.9990	0.5392	0.9643
764	1.0000	1.0000				
768	1.0000	1.0000				
773	1.0000	1.0000	0.6351	1.0000	0.3406	1.0000
793	1.0000	1.0000	0.1442	0.0112	0.0491	0.0027
795	0.0158	0.1241	0.0046	0.0902	0.0253	0.1073

820	0.5777	1.0000	0.8564	1.0000	1.0000	1.0000
852	1.0000	1.0000	0.1100	0.5704	0.0356	0.2893
865	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
866	1.0000	1.0000				
896	1.0000	1.0000	0.7434	1.0000	0.4413	1.0000
950	1.0000	1.0000				

Table 23. AIC_c values for each of the beta-binomial models in Table 3, by species (SVSPP code). Where values are missing either fits were not possible or AIC_c values were infinite. Species for which values are missing for all models are omitted.

SVSPP	$M_{1,1}$	$M_{2,1}$	$M_{1,2}$	$M_{2,2}$	$M_{3,1}$	$M_{1,3}$	$M_{3,2}$	$M_{2,3}$	$M_{3,3}$
1	114.90	116.77	116.42	118.29	114.64	117.93	116.88	119.60	118.79
4	77.15	79.75	79.75	82.61	81.15	78.70	84.31	81.86	84.01
9	16.56	23.56	23.56	37.56	33.00	37.56	75.00	79.56	
13	357.51	356.97	358.55	356.91	356.67	360.35	356.74	358.57	358.47
14	122.83	125.11	124.24	126.62	124.99	126.65	126.63	129.15	129.09
15	2777.43	2777.35	2779.36	2779.24	2779.39	2781.21	2781.29	2781.07	2783.12
16	59.71	62.34	62.34	65.25	65.24	64.04	68.46	67.27	70.82
18	97.26	99.80	99.80	102.57	99.39	98.02	102.43	101.06	102.61
19	87.81	90.44	90.44	93.34	93.33	93.15	96.55	96.38	99.97
21	19.17	17.64	23.46	23.64	23.64	29.46	32.64	32.64	47.64
22	372.69	374.26	370.63	371.91	374.46	371.71	372.52	373.24	373.34
23	1230.70	1232.52	1232.73	1234.58	1231.94	1222.25	1234.01	1224.28	1225.65
24	257.67	255.71	259.80	257.87	257.10	255.61	259.31		253.99
25	84.20	86.63	86.63	89.23	88.87	78.68	91.66	81.48	84.44
26	1934.20	1934.67	1936.18	1936.60	1926.05	1934.66	1928.09	1936.02	1921.06
27	339.78	341.12	335.78	335.58	336.93	337.48	333.22	337.67	334.86
28	318.99	320.80	319.31	320.54	320.93	320.60	320.41	322.13	322.58

29	17.89	23.49	23.49	32.82	28.27	32.10	46.93	50.76	102.93
31	414.32	416.37	415.49	415.80	417.46	417.69	416.99	418.10	419.04
32	1739.59	1740.37	1741.44	1742.41	1737.85	1706.17	1739.90	1707.71	1709.29
33	792.60	790.53	754.59	751.13	791.14	756.43	750.15	753.19	752.30
34	435.42	435.27	420.23	417.92	437.32	421.81	419.95	419.42	421.62
35	222.36	223.63	215.22	216.86	225.78	217.38	219.03	219.05	221.26
36	40.60	40.59	43.08	43.95	41.91	45.14	45.84	46.32	49.13
43	370.83	367.03	363.99	365.82	369.30	359.14	368.17	361.24	361.48
44	345.54	347.81	347.81	350.18	337.99	345.77	340.47	348.25	343.05
46	36.45	37.16	39.02	40.41	32.48	39.81	36.24	41.93	37.34
56	187.60	180.70	186.43	179.43	179.82	188.32	178.88	181.11	181.76
60	16.15	19.10	19.81	23.81	17.53	24.53	23.82	30.10	32.62
69	42.98	46.65	46.65	51.36	51.18	50.55	57.47	56.83	65.31
72	3419.72	3421.68	3410.97	3410.13	3412.62	3411.23	3399.13	3410.92	3401.08
73	580.18	582.09	582.24	584.14	583.32	583.05	585.32	584.62	584.74
74	1348.04	1341.12	1348.16	1342.36	1342.64	1349.41	1343.96	1343.84	1345.61
75	223.92	225.33	225.48	227.17	227.57	224.06	229.48	225.87	228.21
76	856.03	858.05	858.09	860.13	859.55	859.61	861.64	861.70	863.45
77	2032.02	2033.59	2033.85	2035.56	2028.77	2035.76	2030.66	2037.42	2032.49
78	1387.93	1375.44	1387.33	1375.09	1377.36	1389.32	1377.00	1377.13	1379.09
79	65.06	66.92	67.35	68.83	69.52	66.15	71.72	68.12	70.32
83	113.67	115.51	115.65	117.65	113.57	116.80	115.69	117.83	118.00
84	38.79	39.84	41.41	42.74	40.65	44.32			47.48
87	32.43	34.96	35.23	38.13	35.34	38.39	38.96	41.74	43.14
90	32.83	35.68	35.68	38.93	37.82	37.59	41.57	41.35	44.04
91	17.41	24.41	24.41	38.41	38.41	38.41	80.41	80.41	
101	53.18	55.88	49.82	52.74	58.32	52.76	54.71	56.03	58.41
102	914.28	914.44	911.39	911.25	916.35	913.06	913.24	912.90	914.90
103	693.97	679.10	695.39	680.16	679.02	694.18	680.21	676.81	674.96
104	1329.30	1331.02	1329.87	1331.54	1329.84	1331.77	1330.88	1333.33	1332.86
105	981.71	980.50	983.75	982.58	982.33	973.40	984.43	970.65	972.77

106	735.16	735.94	733.43	735.24	737.99	734.68	737.28	736.46	738.59
107	471.24	471.75	469.38	470.56	473.54	471.47	472.22	472.68	474.36
108	600.35	601.68	601.87	602.47	602.36	598.19	603.41	598.25	599.13
109	973.97	971.82	969.62	946.68	964.88	965.02	942.61	947.94	934.53
111	21.55								
112	36.97	39.77	40.04	43.41	42.67	43.68	47.03	47.77	52.36
113	30.50	39.63	40.11	69.63	69.63	70.11			
114	19.32	26.32	26.32	40.32		39.86		81.86	
116	21.55								
117	169.67	171.90	171.74	173.92	167.80	170.19	170.04	172.38	172.00
121	594.74	593.58	596.69	595.64	595.11	591.25	597.23	589.36	591.18
124	25.58	30.38	30.38	37.58	37.58	37.58	49.58	49.58	73.58
126	39.52	42.83	42.83	46.87	46.39	41.50	51.45	46.56	52.18
129	112.93	115.45	115.45	118.19	118.19	118.19	121.18	121.18	124.45
131	2763.83	2750.57	2759.91	2747.94	2750.98	2761.18	2748.23	2748.96	2748.68
132	87.58	87.25	89.97	89.79	89.79	92.51	92.50	92.50	95.40
135	388.00	388.45	389.85	389.75	388.88	391.96	390.28	391.94	391.70
136	526.28	528.53	528.53	530.87	525.02	530.51	527.46	532.95	529.94
139	70.83	71.70	70.05	71.51	74.38	71.62	74.45	73.27	76.14
141	371.86	371.88	371.70	372.93	370.42	373.46	371.78	374.67	372.16
142	61.46	64.45	64.45	67.94	67.92	67.25	72.04	71.37	76.09
143	1180.02	1175.66	1178.40	1174.66	1174.78	1171.60	1174.01	1168.24	1170.20
145	375.70	377.93	377.93	380.25	380.10	380.15	382.52	382.57	384.83
146	57.53	60.13	60.13	62.99	56.05	59.48	59.20	62.64	55.38
148	24.37								
149	572.99	575.22	575.22	577.53	576.35	574.91	578.75	577.30	578.67
151	16.62	26.33	25.81	54.60	56.33	55.81			
155	1160.11	1161.63	1161.73	1163.39	1163.65	1163.61	1165.46	1165.30	1167.34
156	248.75	250.07	250.86	252.07	250.61	248.57	252.61	250.21	252.16
158	26.52	27.86	28.36	32.57	32.20	32.47	38.49	38.23	46.88
159	34.86	35.81	38.03	37.73	39.63	41.85	42.39	42.39	48.22

161	116.50	116.44	116.33	118.30	117.94	118.64	119.67	120.82	122.60
163	1102.68	1103.54	1097.05	1098.72	1104.99	1099.12	1099.83	1100.80	1101.94
164	591.27	593.32	592.85	594.92	592.70	594.91	593.90	597.00	596.01
165	134.53	124.80	136.37	126.74	121.54	132.23	123.82	124.48	121.95
166									
168	54.68	55.42	57.12	58.05	55.17	59.74	58.00	60.87	61.05
170	15.93	19.86	19.86	25.10		25.10		32.43	
171	692.18	694.24	679.89	678.89	691.60	676.79	676.40	676.88	669.44
172	214.62	215.43	213.10	214.46	217.70	214.78	216.80	216.13	218.53
173	51.63	53.88	54.48	57.14	56.85	46.25	60.61	49.29	53.57
174	45.75	48.37	48.37	51.28	41.02	47.50	44.25	50.72	44.21
176	58.00	57.29	60.67	59.80	57.71	62.43	60.47	62.30	64.19
177	20.86	17.92	25.24		31.45	39.24	73.45	73.92	
179	28.48	31.79	31.79	35.83	32.52	35.45	37.58	40.51	44.08
180	20.50								
181	507.05	501.74	506.55	498.00	500.55	505.55	495.02	498.07	497.02
187	14.30	34.30	34.30						
188	30.56	33.41	33.41	36.67	34.27	36.67	38.03	40.43	
191	32.64	30.25	35.49	33.50	32.66	36.65	36.42	35.71	39.76
192	32.79	35.13	29.32	32.31	36.33	32.58	35.33	36.06	39.71
193	641.49	643.46	641.29	642.52	643.85	643.09	643.54	644.49	645.12
194	215.85	217.25	217.44	219.32	217.14	219.84	219.55	221.81	222.16
196	70.30	70.96	72.71	73.54	73.35	75.29	76.11	76.31	79.08
197	465.14	466.92	467.03	468.87	468.46	466.29	470.37	468.34	468.50
198	22.59	26.26	26.26	30.97	30.97	30.97	37.25	37.25	46.05
201	45.28	48.13	48.13	51.39	51.35	51.39	55.11	55.15	59.49
202	19.64	22.95	22.95	26.99	23.61	26.99	28.66	32.05	35.16
204	19.18	23.46	23.46	29.46	29.46	29.46	38.46	38.46	53.46
205	12.35	14.88	15.53	18.70	18.70	19.35	23.37	23.37	29.20
209	97.90	100.50	100.50	103.36	103.36	103.36	106.52	106.52	110.03
211	131.08	128.61	132.94	131.21	129.67	135.54	132.46	134.01	135.47

212	167.78	153.10	165.95	155.51	140.13	166.50	142.67	155.70	145.34
221	58.83	61.33	61.33	64.04	62.11	63.46	65.06	66.41	67.72
229	84.48	79.75	84.28	81.26	82.33	85.04	84.25	78.61	79.68
232	60.60	63.91	63.91	67.95	67.63	67.93	72.69	72.99	79.17
242	21.58	26.34	28.58	40.34	37.63	41.60	79.63	81.63	
262	14.91	34.91	34.91						
263	25.94	29.61	29.61	34.32	32.84	33.48	39.12	39.77	45.52
270	25.46	31.06	31.06	40.39	40.39	40.39	59.06	59.06	115.06
301	705.92	707.80	706.75	708.56	709.86	708.78	710.64	710.62	712.71
305	15.00	35.00	35.00						
307	189.19	191.47	191.47	193.86	189.09	193.56	191.59	196.06	193.98
310	31.37	33.51	34.45	37.15	37.15	37.09	41.51	40.44	45.36
311	15.38	22.38	22.38	36.38	31.82	36.38	73.82	78.38	
312	281.82	282.36	280.66	282.28	284.47	276.67	284.42	278.18	279.38
313	606.45	605.74	608.39	607.62	605.36	609.32	607.33	608.26	609.11
314	16.15	19.81	19.81	24.53	24.53	24.53	30.81	30.81	39.61
316	48.41	50.68	50.90	53.85	53.12	50.21	56.74	53.60	57.47
317	106.88	100.54	108.22	101.79	100.51	110.01	101.65	103.26	102.11
318	90.45	92.73	92.73	95.13	95.01	94.91	97.52	97.42	99.63
319	98.87	98.44	100.31	101.26	101.24	94.41	104.34	96.43	95.63
320	90.51	92.64	92.90	95.18	90.85	86.68	93.56	89.05	91.77
321	53.00	55.66	55.66	58.62	58.49	57.58	61.80	60.89	64.37
322	147.97	150.21	150.21	152.54	150.89	149.74	153.32	152.16	152.05
323	12.22	16.50	16.50	22.50	22.28	22.50	31.28	31.50	46.28
324	38.23	41.07	40.83	44.09	41.96	44.09	45.50	47.85	49.89
325	15.72	19.54	20.01	25.53	24.38	26.01	33.38	34.53	48.38
360	53.43	56.35	56.35	59.71	56.80	58.16	60.72	62.09	65.36
375	63.48	66.27	66.27	69.44	63.11	65.07	66.73	68.69	70.68
376	41.49	45.15	45.15	49.87	49.20	49.53	55.49	55.82	63.98
390	48.66	41.76	49.12	44.41	43.18	45.40	46.05	41.47	42.90
401	1838.10	1839.77	1837.37	1838.00	1838.27	1834.59	1836.40	1835.40	1836.06

421	39.24	41.72	41.72	44.40	42.42	44.40	45.32	47.29	48.47
425	16.32	26.32	26.32	56.32	55.64	56.32			
428	140.51	142.97	142.97	145.62	145.62	145.62	148.48	148.48	151.58
429	72.82	75.90	75.90	79.53	79.53	79.53	83.90	83.90	89.23
435	123.41	122.42	125.78	124.94	120.85	127.05	123.54	126.21	124.22
439	44.27	48.56	48.56	54.56	52.57	52.96	61.57	61.96	76.57
461	16.99	22.59	22.59	31.92	31.74	31.92	50.41	50.59	106.41
489	34.62	37.70	37.70	41.33	36.65	39.89	41.02	44.25	45.87
490	20.50								
501	28.02	31.68	31.68	36.40	33.02	35.69	39.31	41.98	48.11
502	1488.38	1486.38	1489.69	1487.79	1485.25	1490.47	1486.57	1488.14	1485.95
503	3712.51	3712.51	3714.39	3714.45	3711.59	3712.55	3713.56	3712.83	3712.88
504	33.77	39.37	39.37	48.70	45.83	48.70	64.50	67.37	120.08
506	114.00	115.50	113.19	111.46	116.95	115.21	113.02	113.62	115.38
512	277.49	269.09	274.13	269.93	270.00	274.19	270.89	269.84	270.83
517	20.50								
530	19.83								
563	21.34								
567	16.73	36.73	36.73						
570	17.36	37.36	37.36						
573	29.37	39.37	39.37	69.37	69.37	69.37			
604	19.66	29.41	29.66	59.41	56.63	59.66			
631	20.50								
640	87.00	89.74	89.74	92.83	91.52	86.40	95.02	89.90	93.69
651	126.60	129.34	129.34	132.43	128.94	131.67	132.44	135.17	136.41
652	155.22	157.66	157.66	160.29	157.10	160.26	159.92	163.09	162.36
657	15.54	20.33	20.33	27.53	27.53	27.53	39.53	39.53	63.53
659	27.00	32.60	32.60	41.94	40.93	40.94	59.60	59.60	114.83
694	44.22	47.13	47.13	50.49	50.49	50.49	54.42	54.42	59.05
735	21.13	20.52	24.68	29.85	28.41	34.01	47.08	48.52	103.07
745	64.22	67.30	67.30	70.94	70.94	70.94	75.30	75.30	80.64

759	40.89	43.88	43.88	47.37	46.99	47.37	51.11	51.49	56.02
764	20.50								
768	21.55								
773	13.41	23.41	23.41	53.41	52.50	53.41			
793	36.70	40.37	40.37	45.08	41.21	36.11	47.50	42.39	51.18
795	90.57	87.11	90.57	87.56	84.69	90.63	85.22	87.63	82.26
820	22.73	26.35	26.66	31.59	31.59	31.90	38.92	38.92	49.92
852	31.90	37.50	37.50	46.83	42.42	45.71	61.09	64.38	115.11
865	23.99	28.79	28.79	35.99	35.99	35.99	47.99	47.99	71.99
866	21.55								
896	23.15	30.15	30.15	44.15	43.56	44.15	85.56	86.15	
950	20.79								

Table 24. Using model $M_{1,1}$, species-specific MLEs of ρ across all stations, standard errors, and 95% confidence intervals.

SVSPP	$\hat{\rho}$	$SE(\hat{\rho})$	$CI_L(\hat{\rho})$	$CI_U(\hat{\rho})$
1	1.2322	0.2969	0.7684	1.9758
2	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞
3	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞
4	1.4985	0.4214	0.8635	2.6004
9	0.7501	0.5729	0.1679	3.3513
12	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
13	1.1608	0.1531	0.8963	1.5032
14	3.8402	0.9052	2.4194	6.0954
15	1.1468	0.0441	1.0636	1.2365
16	2.1824	0.6598	1.2067	3.9473
18	1.2321	0.3273	0.7320	2.0739
19	1.1805	0.2467	0.7838	1.7781
21	0.6667	0.4303	0.1881	2.3624
22	4.4400	0.5205	3.5286	5.5868
23	3.4900	0.2537	3.0266	4.0244
24	6.6893	0.8389	5.2315	8.5533
25	5.2109	1.4221	3.0521	8.8965
26	7.3697	0.4777	6.4904	8.3681
27	4.3842	0.6272	3.3122	5.8033
28	3.7919	0.5399	2.8685	5.0126
29	0.2818	0.2192	0.0613	1.2944
30	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$
31	1.2274	0.2520	0.8208	1.8355
32	2.0874	0.1704	1.7787	2.4496
33	1.3233	0.1416	1.0729	1.6320
34	1.2897	0.1926	0.9624	1.7282
35	1.7433	0.3167	1.2210	2.4889
36	2.1895	1.0470	0.8576	5.5896
43	0.2249	0.0622	0.1308	0.3869
44	1.4283	0.3338	0.9034	2.2581
46	1.8681	0.8754	0.7456	4.6805
56	0.5047	0.1294	0.3052	0.8343
60	0.2000	0.1549	0.0438	0.9128
66	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
67	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞
69	2.8538	0.8149	1.6307	4.9943
72	4.7147	0.2077	4.3247	5.1399
73	1.9873	0.1939	1.6415	2.4061
74	1.4242	0.0876	1.2624	1.6067
75	0.8571	0.1624	0.5913	1.2425

76	2.2354	0.1726	1.9214	2.6008
77	3.2003	0.1791	2.8679	3.5712
78	3.1566	0.2517	2.6999	3.6906
79	4.7378	2.0737	2.0092	11.1721
83	6.3766	1.3652	4.1913	9.7013
84	3.9994	1.4911	1.9259	8.3051
87	1.0000	0.4472	0.4162	2.4025
90	3.3747	1.7821	1.1988	9.5001
91	10.2786	9.4943	1.6814	62.8323
99	2.9994	2.0001	0.8117	11.0829
101	0.8423	0.3126	0.4070	1.7431
102	1.9955	0.0970	1.8142	2.1949
103	2.2908	0.1572	2.0026	2.6205
104	3.8084	0.2225	3.3963	4.2704
105	2.0432	0.1401	1.7863	2.3370
106	2.4900	0.2101	2.1104	2.9378
107	3.2572	0.3358	2.6612	3.9866
108	2.8183	0.2369	2.3902	3.3230
109	8.2489	0.9877	6.5235	10.4308
111	1.0000	1.0000	0.1409	7.0993
112	3.4992	0.9362	2.0712	5.9118
113	0.2503	0.1324	0.0887	0.7058
114	0.1358	0.1442	0.0170	1.0882
115	0.3333	0.3849	0.0347	3.2044
116	1.0000	1.0000	0.1409	7.0991
117	2.7758	0.7238	1.6651	4.6275
118	$>10^4$	$>10^4$	$\le 10^{-4}$	∞
120	$>10^4$	$>10^4$	$>10^4$	$>10^4$
121	1.1878	0.1565	0.9175	1.5379
124	1.2918	0.8551	0.3530	4.7275
126	2.4954	1.3282	0.8791	7.0829
127	0.9999	1.4141	0.0625	15.9872
129	1.0890	0.2913	0.6446	1.8397
131	1.4941	0.0990	1.3121	1.7013
132	1.0762	0.3246	0.5958	1.9438
135	1.1598	0.1654	0.8770	1.5337
136	1.1336	0.2035	0.7973	1.6117
137	0.5000	0.6124	0.0453	5.5144
139	0.7087	0.2314	0.3737	1.3440
141	3.4160	0.4993	2.5651	4.5491
142	1.9531	0.8441	0.8372	4.5564
143	2.5607	0.2612	2.0967	3.1275
145	1.5768	0.2674	1.1309	2.1985
146	3.6389	1.6300	1.5125	8.7551
148	4.9267	3.3291	1.3103	18.5243
149	1.5409	0.2468	1.1258	2.1090

151	4.9995	3.8729	1.0953	22.8204
154	1.0001	1.4144	0.0625	15.9909
155	1.4564	0.1301	1.2224	1.7351
156	2.7353	0.4936	1.9205	3.8959
158	9.2696	5.4027	2.9576	29.0519
159	4.6531	2.5234	1.6074	13.4698
160	2.0005	2.4502	0.1814	22.0650
161	3.7642	1.1101	2.1117	6.7095
163	3.4854	0.2086	3.0997	3.9191
164	1.8022	0.1581	1.5174	2.1403
165	3.5375	0.8631	2.1928	5.7067
166	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞
168	2.6803	0.9567	1.3315	5.3951
170	0.2222	0.1737	0.0480	1.0285
171	4.4943	0.5016	3.6112	5.5933
172	2.9504	0.5584	2.0361	4.2754
173	2.9054	1.2899	1.2170	6.9360
174	2.8400	1.2947	1.1621	6.9402
175	$>10^4$	$>10^4$	$>10^4$	$>10^4$
176	1.9732	0.6832	1.0011	3.8894
177	0.9903	0.6570	0.2698	3.6347
179	1.1116	0.5726	0.4050	3.0509
180	0.3333	0.3849	0.0347	3.2045
181	0.5702	0.0866	0.4235	0.7679
183	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
184	0.5000	0.6124	0.0453	5.5144
186	2.0001	2.4497	0.1814	22.0586
187	9.0005	9.4880	1.1401	71.0516
188	10.4282	4.1277	4.8005	22.6534
190	1.0000	1.4142	0.0625	15.9875
191	2.6835	1.3551	0.9974	7.2200
192	3.4329	1.7145	1.2898	9.1366
193	4.5752	0.4496	3.7736	5.5471
194	1.9195	0.3522	1.3397	2.7503
195	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞
196	3.8790	0.6259	2.8272	5.3219
197	7.1295	0.7930	5.7329	8.8663
198	1.5714	0.7598	0.6092	4.0538
199	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞
201	0.7521	0.3131	0.3326	1.7006
202	3.6669	2.3884	1.0230	13.1441
203	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
204	1.5001	0.9683	0.4233	5.3157
205	14.0010	14.4930	1.8410	106.4807
206	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞

208	2.0001	2.4497	0.1814	22.0586
209	1.0141	0.3264	0.5396	1.9057
211	0.9725	0.2912	0.5408	1.7491
212	0.8078	0.2091	0.4864	1.3416
213	2.0005	2.4502	0.1814	22.0650
221	0.8259	0.2974	0.4077	1.6729
228	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞
229	0.7481	0.2666	0.3721	1.5043
232	1.0983	0.4574	0.4855	2.4841
239	$>10^4$	$>10^4$	$>10^4$	$>10^4$
240	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
242	0.5872	0.4280	0.1407	2.4505
249	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞
252	7.6654	4.7071	2.3006	25.5404
262	0.0518	0.0670	0.0041	0.6542
263	2.8746	1.8594	0.8091	10.2131
270	0.5823	0.4199	0.1417	2.3930
301	1.5535	0.1219	1.3321	1.8117
302	1.0001	0.5346	0.3508	2.8513
305	0.2500	0.2795	0.0279	2.2367
307	4.1846	1.2110	2.3731	7.3788
310	6.1094	2.2024	3.0140	12.3837
311	2.5001	2.0917	0.4850	12.8862
312	2.7312	0.4419	1.9890	3.7503
313	3.1676	0.3577	2.5387	3.9523
314	5.0005	3.8735	1.0956	22.8235
316	8.8558	5.9730	2.3611	33.2157
317	2.4204	0.6483	1.4318	4.0914
318	5.1172	1.3670	3.0314	8.6382
319	4.1710	1.6033	1.9635	8.8602
320	7.1897	2.4718	3.6649	14.1042
321	1.7587	0.7404	0.7707	4.0136
322	6.0729	1.9070	3.2817	11.2381
323	9.0030	9.4914	1.1403	71.0825
324	2.0091	0.8168	0.9056	4.4572
325	4.0001	3.1624	0.8494	18.8369
339	1.0000	1.4142	0.0625	15.9875
360	0.3713	0.1125	0.2051	0.6724
364	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞
375	0.9149	0.2594	0.5248	1.5950
376	3.1310	1.2429	1.4381	6.8167
378	$>10^4$	$>10^4$	$>10^4$	$>10^4$
380	0.4999	0.6123	0.0453	5.5136
384	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞
388	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞

390	3.0362	1.0851	1.5071	6.1168
401	3.2200	0.2451	2.7737	3.7382
421	2.7500	1.1354	1.2244	6.1769
425	1.0001	0.8166	0.2018	4.9550
428	6.1064	1.9969	3.2168	11.5916
429	1.4494	0.6128	0.6329	3.3195
435	4.2511	1.1329	2.5215	7.1671
437	$\le 10^{-4}$	$\le 10^{-4}$	$\le 10^{-4}$	∞
438	$\le 10^{-4}$	$\le 10^{-4}$	$\le 10^{-4}$	∞
439	4.9243	0.6659	3.7777	6.4188
444	4.4998	3.5178	0.9722	20.8274
446	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	∞
449	1.5032	1.5792	0.1918	11.7827
451	1.9999	2.4493	0.1813	22.0548
452	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	∞
457	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	∞
458	0.9999	1.4141	0.0625	15.9872
459	0.4999	0.6123	0.0453	5.5137
461	0.6000	0.4382	0.1434	2.5107
465	1.0000	1.0000	0.1409	7.0991
471	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	∞
489	2.3763	1.1903	0.8903	6.3426
490	3.0008	3.4653	0.3121	28.8533
501	0.7829	0.4404	0.2599	2.3581
502	1.3797	0.1028	1.1922	1.5966
503	1.6904	0.0891	1.5244	1.8743
504	1.2073	0.6873	0.3956	3.6849
506	14.8378	3.7327	9.0622	24.2944
508	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	∞
509	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	∞
510	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	∞
511	$> 10^{4}$	$> 10^{4}$	$> 10^{4}$	$> 10^{4}$
512	2.3088	0.3840	1.6666	3.1985
516	0.9999	1.4141	0.0625	15.9872
517	3.0008	3.4653	0.3121	28.8533
526	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	∞
527	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	∞
530	7.0005	7.4843	0.8612	56.9065
538	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	∞
541	$> 10^{4}$	$> 10^{4}$	$> 10^{4}$	$> 10^{4}$
546	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	∞
551	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	∞
552	1.0001	1.4144	0.0625	15.9909
563	0.6665	0.6085	0.1114	3.9891

564	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
567	0.6667	0.6086	0.1114	3.9898
568	0.5000	0.6124	0.0453	5.5141
570	1.3332	1.0183	0.2984	5.9573
573	1.3696	0.9565	0.3484	5.3832
596	0.4999	0.6123	0.0453	5.5137
599	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
604	1.8375	1.4197	0.4042	8.3535
616	2.0000	2.4496	0.1813	22.0581
617	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
621	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
625	1.0000	1.4142	0.0625	15.9875
627	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
631	2.9995	3.4635	0.3120	28.8347
640	0.3803	0.1362	0.1885	0.7672
646	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
648	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
651	0.8322	0.2710	0.4396	1.5753
652	4.0496	1.1238	2.3506	6.9764
657	3.5003	2.8066	0.7271	16.8506
659	0.2643	0.1778	0.0708	0.9876
694	1.7475	0.7513	0.7524	4.0587
726	1.2503	0.8393	0.3354	4.6604
735	2.6024	1.9370	0.6051	11.1929
745	1.7651	0.6354	0.8716	3.5743
749	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
754	1.0002	1.4145	0.0626	15.9913
759	1.2310	0.5690	0.4976	3.0457
760	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
761	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
762	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
763	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
764	3.0005	3.4648	0.3121	28.8481
768	1.0000	1.0000	0.1409	7.0990
769	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
773	4.9999	5.4771	0.5841	42.7967
780	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$
789	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
793	5.5069	2.9200	1.9479	15.5686
794	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
795	1.9051	0.6208	1.0059	3.6080
820	6.1960	4.5595	1.4647	26.2114
830	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
833	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞

843	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
849	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	∞
852	1.1757	0.7891	0.3155	4.3816
856	1.0002	1.4145	0.0626	15.9913
857	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	∞
858	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	∞
860	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	∞
861	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	∞
862	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	∞
865	0.2083	0.1681	0.0428	1.0127
866	1.0000	1.0000	0.1409	7.0992
873	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	∞
876	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	∞
878	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	∞
880	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	∞
896	0.3276	0.2102	0.0932	1.1523
910	1.9645	2.4968	0.1627	23.7195
950	2.5007	2.0932	0.4848	12.8986

Table 25. Using model $M_{1,2}$, species-specific MLEs of ρ across all stations, standard errors, and 95% confidence intervals.

SVSPP	$\widehat{\rho}$	$SE(\widehat{\rho})$	$CI_L(\widehat{\rho})$	$CI_U(\widehat{\rho})$
1	1.2575	0.3041	0.7828	2.0199
13	1.1246	0.1522	0.8626	1.4663
14	3.8051	0.9034	2.3893	6.0599
15	1.1446	0.0446	1.0605	1.2353
21	0.6667	0.4303	0.1881	2.3624
22	4.4560	0.5118	3.5578	5.5809
23	3.4882	0.2539	3.0243	4.0231
26	7.3585	0.4797	6.4760	8.3613
27	4.7626	0.6650	3.6224	6.2618
28	3.9302	0.5639	2.9668	5.2065
31	1.2013	0.2494	0.7997	1.8046
32	2.0865	0.1703	1.7780	2.4484
33	1.5303	0.1415	1.2767	1.8344
34	1.4156	0.2079	1.0615	1.8879
35	1.6278	0.2884	1.1502	2.3037
36	2.2712	1.0991	0.8797	5.8638
43	0.2405	0.0643	0.1425	0.4060
46	1.8300	0.8580	0.7301	4.5871
56	0.5603	0.1409	0.3422	0.9173

60	0.2000	0.1549	0.0438	0.9128
72	4.7802	0.2053	4.3943	5.1999
73	1.9882	0.1940	1.6420	2.4073
74	1.3906	0.0874	1.2294	1.5730
75	0.8448	0.1600	0.5828	1.2244
76	2.2359	0.1727	1.9218	2.6013
77	3.1986	0.1791	2.8663	3.5696
78	3.2643	0.2644	2.7852	3.8258
79	4.8385	2.1452	2.0292	11.5372
83	6.4280	1.3558	4.2515	9.7186
84	3.9997	1.4908	1.9265	8.3040
87	1.0000	0.4472	0.4162	2.4025
101	0.8653	0.2836	0.4552	1.6451
102	2.0160	0.0934	1.8411	2.2076
103	2.3581	0.1799	2.0306	2.7385
104	3.8205	0.2223	3.4088	4.2820
105	2.0396	0.1413	1.7806	2.3363
106	2.5135	0.2079	2.1372	2.9559
107	3.1793	0.3223	2.6064	3.8782
108	2.7845	0.2407	2.3506	3.2986
109	9.5952	1.2805	7.3868	12.4638
112	3.4998	0.9350	2.0731	5.9082
113	0.2628	0.1359	0.0954	0.7242
116	1.0000	1.0000	0.1409	7.0991
117	2.8155	0.7459	1.6751	4.7321
121	1.1963	0.1592	0.9216	1.5529
131	1.5599	0.1058	1.3658	1.7816
135	1.1475	0.1657	0.8646	1.5230
139	0.7928	0.1320	0.5720	1.0988
141	3.3542	0.4821	2.5307	4.4457
143	2.4153	0.2545	1.9645	2.9694
151	4.0003	3.1627	0.8494	18.8392
155	1.4525	0.1295	1.2196	1.7298
156	2.7406	0.4943	1.9246	3.9027
158	7.6845	4.3550	2.5306	23.3354
159	4.5587	2.6471	1.4608	14.2266
161	3.8150	1.0781	2.1925	6.6380
163	3.4274	0.1952	3.0654	3.8322
164	1.7959	0.1568	1.5134	2.1310
165	3.3155	0.8711	1.9811	5.5487
171	4.9355	0.5067	4.0359	6.0357
172	2.8409	0.4882	2.0285	3.9786
176	1.9715	0.6930	0.9899	3.9264
177	1.5995	0.9123	0.5230	4.8919
181	0.5290	0.0851	0.3859	0.7251
183	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$

190	1.0000	1.4142	0.0625	15.9875
191	2.6835	1.3551	0.9974	7.2200
192	3.6675	1.6895	1.4868	9.0466
193	4.6496	0.4521	3.8429	5.6258
194	1.9101	0.3506	1.3330	2.7371
196	3.8781	0.6224	2.8314	5.3118
197	7.1262	0.7943	5.7277	8.8661
205	14.0054	14.4995	1.8411	106.5430
211	0.9846	0.2945	0.5478	1.7696
212	0.8902	0.2301	0.5364	1.4776
229	0.8418	0.2973	0.4213	1.6821
242	0.5872	0.4280	0.1407	2.4505
249	$>10^4$	$>10^4$	$\le 10^{-4}$	∞
301	1.5493	0.1210	1.3294	1.8057
310	6.1095	$\le 10^{-4}$	6.1095	6.1095
312	2.7694	0.4465	2.0191	3.7986
313	3.1593	0.3569	2.5319	3.9423
316	8.7109	5.8083	2.3577	32.1834
317	2.4589	0.6631	1.4495	4.1715
319	4.0350	1.5361	1.9134	8.5091
324	2.0055	0.8197	0.9002	4.4682
325	4.0001	3.1624	0.8494	18.8369
380	0.4999	0.6123	0.0453	5.5140
390	2.7291	0.9670	1.3628	5.4653
401	3.2613	0.2478	2.8100	3.7850
452	$>10^4$	$>10^4$	$\le 10^{-4}$	∞
502	1.3938	0.1050	1.2025	1.6155
503	1.6867	0.0894	1.5204	1.8713
506	13.8006	3.5581	8.3260	22.8749
511	$>10^4$	6240.5157	$>10^4$	$>10^4$
512	2.0878	0.3473	1.5070	2.8925
735	2.1937	1.4619	0.5942	8.0988
795	2.0704	0.7004	1.0669	4.0181

Table 26. Using model $M_{1,3}$, species-specific MLEs of ρ across all stations, standard errors, and 95% confidence intervals.

SVSPP	$\hat{\rho}$	$SE(\hat{\rho})$	$CI_L(\hat{\rho})$	$CI_U(\hat{\rho})$
1	1.1988	0.2972	0.7374	1.9490
13	1.1384	0.1546	0.8723	1.4855
14	3.7842	0.9126	2.3588	6.0710
15	1.1453	0.0446	1.0611	1.2360
22	4.5248	0.5162	3.6181	5.6587

23	3.4108	0.2403	2.9709	3.9158
24	7.2411	0.8702	5.7215	9.1642
26	7.6632	0.5167	6.7145	8.7459
27	4.8539	0.6869	3.6781	6.4055
28	3.8526	0.5529	2.9081	5.1040
30	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
31	1.1959	0.2490	0.7952	1.7985
32	2.0290	0.1521	1.7517	2.3501
33	1.5164	0.1424	1.2614	1.8230
34	1.4243	0.2088	1.0685	1.8985
35	1.6238	0.2884	1.1465	2.2998
36	2.6399	1.3843	0.9446	7.3778
43	0.2144	0.0562	0.1282	0.3584
46	2.1374	1.0451	0.8197	5.5730
56	0.6012	0.1571	0.3603	1.0033
60	0.2000	0.1549	0.0438	0.9128
72	4.7309	0.2054	4.3449	5.1512
73	2.0447	0.2057	1.6789	2.4903
74	1.3893	0.0868	1.2292	1.5703
75	0.8506	0.1564	0.5932	1.2195
76	2.2158	0.1727	1.9019	2.5815
77	3.1891	0.1805	2.8543	3.5632
78	3.2609	0.2642	2.7821	3.8221
79	5.0128	1.6730	2.6061	9.6421
83	5.4618	1.3138	3.4087	8.7516
84	3.9998	1.4908	1.9266	8.3041
87	1.0000	0.4472	0.4162	2.4025
101	0.8957	0.2950	0.4698	1.7080
102	2.0177	0.0935	1.8426	2.2095
103	2.4645	0.1928	2.1142	2.8728
104	3.8008	0.2265	3.3817	4.2717
105	2.1283	0.1365	1.8769	2.4134
106	2.5229	0.2090	2.1448	2.9678
107	3.1833	0.3275	2.6019	3.8946
108	2.9121	0.2435	2.4718	3.4308
109	11.1100	1.4865	8.5472	14.4412
112	3.4997	0.9347	2.0735	5.9070
113	0.2629	0.1359	0.0954	0.7241
117	2.4745	0.6254	1.5079	4.0607
121	1.2583	0.1672	0.9698	1.6327
131	1.5661	0.1064	1.3708	1.7893
135	1.1426	0.1658	0.8598	1.5184
139	0.8026	0.1340	0.5786	1.1134
141	3.3707	0.4861	2.5408	4.4717
143	2.4031	0.2460	1.9661	2.9371
155	1.4513	0.1292	1.2189	1.7280

156	2.5123	0.4321	1.7934	3.5195
158	7.4134	4.2160	2.4318	22.5993
161	3.8494	1.1481	2.1455	6.9067
163	3.4275	0.1972	3.0621	3.8366
164	1.7899	0.1643	1.4951	2.1427
165	3.4925	0.8934	2.1155	5.7660
171	5.0921	0.5057	4.1914	6.1864
172	2.8697	0.4965	2.0444	4.0282
173	2.3671	0.5165	1.5434	3.6303
176	1.8732	0.6561	0.9428	3.7216
177	1.5997	0.9123	0.5231	4.8917
180	0.3333	0.3849	0.0347	3.2045
181	0.5390	0.0857	0.3948	0.7360
190	1.0000	1.4142	0.0625	15.9875
191	2.4766	1.1856	0.9691	6.3290
192	3.6669	1.6890	1.4867	9.0440
193	4.6975	0.4661	3.8673	5.7058
194	1.9107	0.3748	1.3009	2.8064
196	3.8785	0.6242	2.8294	5.3168
197	7.4825	0.8184	6.0388	9.2714
212	0.9347	0.2422	0.5625	1.5533
229	0.7933	0.2889	0.3885	1.6196
242	0.7188	0.5403	0.1647	3.1368
301	1.5467	0.1217	1.3256	1.8047
312	2.6929	0.4247	1.9768	3.6683
313	3.0912	0.3541	2.4696	3.8692
316	8.3020	4.6552	2.7662	24.9161
317	2.5338	0.7021	1.4721	4.3614
319	7.2220	2.4994	3.6650	14.2312
324	2.0055	0.8197	0.9001	4.4680
325	4.0001	3.1624	0.8494	18.8368
390	3.0000	1.0955	1.4666	6.1368
401	3.2370	0.2442	2.7921	3.7527
502	1.4075	0.1064	1.2136	1.6322
503	1.6771	0.0885	1.5124	1.8599
506	13.4977	3.5423	8.0699	22.5760
512	2.0599	0.3409	1.4893	2.8490
604	1.8378	1.4203	0.4041	8.3583
735	2.1943	1.4622	0.5944	8.1003
795	2.1189	0.7252	1.0833	4.1444

Table 27. Using model $M_{2,1}$, species-specific MLEs of ρ for survey stations, standard errors, and 95% confidence intervals.

SVSPP	$\widehat{\rho}$	$SE(\widehat{\rho})$	$CI_L(\widehat{\rho})$	$CI_U(\widehat{\rho})$
1	1.0886	0.3439	0.5861	2.0219
13	1.2948	0.1910	0.9697	1.7290
14	3.9143	1.0316	2.3352	6.5612
15	1.2024	0.0604	1.0896	1.3269
21	1.9999	1.7319	0.3663	10.9185
22	4.1640	0.6086	3.1268	5.5453
23	3.5880	0.3374	2.9841	4.3141
24	6.7813	0.8549	5.2967	8.6819
26	6.9673	0.5429	5.9805	8.1170
27	3.9068	0.7449	2.6886	5.6770
28	4.1600	0.9275	2.6873	6.4398
30	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
31	1.2426	0.2579	0.8273	1.8664
32	2.2375	0.2297	1.8297	2.7363
33	1.5539	0.2049	1.1999	2.0122
34	1.5276	0.2867	1.0574	2.2067
35	1.5180	0.3521	0.9635	2.3916
36	2.7073	1.3802	0.9968	7.3532
43	0.2678	0.0751	0.1546	0.4639
46	1.5454	0.7472	0.5991	3.9867
56	0.6447	0.1702	0.3843	1.0815
60	0.1250	0.1326	0.0156	0.9994
72	4.7571	0.2636	4.2674	5.3029
73	2.0640	0.2780	1.5851	2.6877
74	1.7453	0.1587	1.4604	2.0858
75	0.7414	0.1876	0.4515	1.2175
76	2.2614	0.2181	1.8718	2.7320
77	3.1016	0.2241	2.6920	3.5734
78	3.6445	0.3199	3.0685	4.3286
79	3.9921	1.9300	1.5477	10.2972
83	5.7478	1.5890	3.3434	9.8813
84	2.8570	1.2550	1.2078	6.7581
87	0.8750	0.4528	0.3173	2.4128
101	0.8362	0.3420	0.3752	1.8638
102	2.1315	0.1466	1.8627	2.4390
103	2.7064	0.2070	2.3296	3.1440
104	3.7154	0.2697	3.2226	4.2835
105	2.2838	0.2114	1.9049	2.7382
106	2.7003	0.3000	2.1720	3.3571
107	3.0146	0.3561	2.3916	3.8000
108	2.9122	0.2698	2.4286	3.4921
109	7.0872	0.9633	5.4298	9.2505
112	3.2669	0.9642	1.8319	5.8260
113	0.2781	0.1425	0.1018	0.7593

116	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
117	2.7839	0.7488	1.6432	4.7163
121	1.3805	0.2150	1.0173	1.8734
131	1.7568	0.1361	1.5093	2.0449
132	0.9828	0.3000	0.5403	1.7877
135	1.2431	0.1887	0.9232	1.6739
139	1.0113	0.4315	0.4382	2.3339
141	3.9306	0.6912	2.7847	5.5481
143	3.0387	0.3695	2.3943	3.8564
151	2.9955	3.4604	0.3113	28.8253
155	1.3779	0.1592	1.0987	1.7282
156	2.9266	0.5691	1.9992	4.2844
158	7.1025	4.1497	2.2599	22.3221
159	2.9386	1.6246	0.9944	8.6842
161	2.7643	0.9626	1.3969	5.4701
163	3.2967	0.2564	2.8306	3.8396
164	1.7964	0.2008	1.4430	2.2362
165	1.5230	0.4834	0.8175	2.8371
168	3.3396	1.3870	1.4797	7.5373
171	4.4705	0.5855	3.4584	5.7788
172	3.2518	0.6785	2.1603	4.8947
173	2.7581	1.2374	1.1448	6.6448
176	3.3221	1.6328	1.2678	8.7049
177	3.9999	3.1622	0.8494	18.8361
180	0.4999	0.6123	0.0453	5.5135
181	0.3743	0.0828	0.2426	0.5774
183	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$
190	$\leq 10^{-4}$	0.0003	$\leq 10^{-4}$	∞
191	5.4659	3.6414	1.4812	20.1710
192	2.0738	1.6897	0.4200	10.2399
193	4.4718	0.5681	3.4862	5.7361
194	2.0967	0.4330	1.3988	3.1427
196	4.0007	0.6561	2.9011	5.5173
197	6.8419	0.9339	5.2359	8.9404
205	10.0038	10.4938	1.2802	78.1733
211	1.1362	0.3540	0.6169	2.0925
212	1.2306	0.3379	0.7185	2.1078
229	0.1925	0.1298	0.0513	0.7217
242	0.3910	0.3265	0.0761	2.0087
301	1.5835	0.1450	1.3233	1.8948
310	5.7774	2.0898	2.8434	11.7390
312	2.4324	0.4489	1.6941	3.4925
313	2.9316	0.3573	2.3086	3.7226
316	8.3082	5.6199	2.2066	31.2815
317	3.5000	1.0883	1.9028	6.4377
319	3.5567	1.4257	1.6213	7.8027

320	7.0855	2.4473	3.6006	13.9435
324	2.0591	1.0932	0.7274	5.8290
325	3.5003	2.8066	0.7271	16.8501
380	0.9999	1.4140	0.0625	15.9860
390	1.8202	0.6854	0.8702	3.8073
401	3.3220	0.3068	2.7720	3.9813
435	4.5055	1.2097	2.6619	7.6259
452	$>10^4$	$>10^4$	$\le 10^{-4}$	∞
502	1.5709	0.1552	1.2942	1.9066
503	1.7770	0.1128	1.5691	2.0124
506	16.0921	4.2691	9.5675	27.0664
511	$>10^4$	$>10^4$	$\le 10^{-4}$	∞
512	1.6897	0.3096	1.1799	2.4199
517	$\le 10^{-4}$	0.0003	$\le 10^{-4}$	∞
604	1.0003	1.4146	0.0626	15.9917
616	$>10^4$	$>10^4$	$\le 10^{-4}$	∞
735	0.8528	0.7820	0.1413	5.1454
795	2.6526	0.9761	1.2896	5.4562
820	5.7227	4.3044	1.3103	24.9941

Table 28. Using model $M_{2,1}$, species-specific MLEs of ρ for site-specific stations, standard errors, and 95% confidence intervals.

SVSPP	$\widehat{\rho}$	$SE(\widehat{\rho})$	$CI_L(\widehat{\rho})$	$CI_U(\widehat{\rho})$
1	1.4605	0.5446	0.7033	3.0331
13	0.7652	0.2180	0.4377	1.3375
14	3.5936	1.6670	1.4477	8.9203
15	1.0737	0.0634	0.9564	1.2053
21	$\le 10^{-4}$	0.0021	$\le 10^{-4}$	$>10^4$
22	4.9438	0.9620	3.3762	7.2392
23	3.3523	0.3729	2.6955	4.1691
24	0.0010	0.0323	$\le 10^{-4}$	$>10^4$
26	8.1255	0.8364	6.6409	9.9419
27	4.9953	1.0483	3.3107	7.5369
28	3.5606	0.6466	2.4943	5.0827
31	0.6974	0.9604	0.0469	10.3674
32	1.8741	0.2351	1.4657	2.3964
33	0.9847	0.1758	0.6940	1.3972
34	0.9639	0.2363	0.5962	1.5585
35	2.1479	0.6272	1.2119	3.8068
36	0.0003	0.0148	$\le 10^{-4}$	$>10^4$
43	0.0357	0.0373	0.0046	0.2775

46	$>10^4$	$>10^4$	$\leq 10^{-4}$	$>10^4$
56	0.0535	0.0560	0.0069	0.4167
60	0.4999	0.6123	0.0453	5.5137
72	4.6542	0.3044	4.0942	5.2907
73	1.9087	0.2641	1.4553	2.5033
74	1.2119	0.0973	1.0353	1.4185
75	1.0323	0.2911	0.5940	1.7941
76	2.1903	0.2794	1.7057	2.8125
77	3.3394	0.2815	2.8309	3.9393
78	1.7055	0.2884	1.2244	2.3756
79	9.4392	10.0298	1.1762	75.7527
83	7.4341	2.5934	3.7522	14.7289
84	7.9989	5.9996	1.8390	34.7922
87	1.5001	1.3694	0.2506	8.9773
101	0.8709	0.7551	0.1592	4.7638
102	1.8651	0.1285	1.6295	2.1346
103	1.4348	0.1711	1.1357	1.8125
104	3.9791	0.3900	3.2836	4.8219
105	1.7864	0.1782	1.4692	2.1722
106	2.2458	0.2769	1.7637	2.8597
107	4.0449	0.8382	2.6947	6.0715
108	2.4202	0.4654	1.6601	3.5281
109	10.7295	1.9201	7.5552	15.2373
112	4.6638	2.9679	1.3399	16.2339
113	$\leq 10^{-4}$	0.0089	$\leq 10^{-4}$	$>10^4$
116	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
117	2.6761	2.3222	0.4885	14.6597
121	0.8142	0.2012	0.5016	1.3214
131	0.9788	0.1213	0.7678	1.2479
132	2923.6576	$>10^4$	$\leq 10^{-4}$	$>10^4$
135	0.7057	0.2893	0.3160	1.5762
139	0.4311	0.2252	0.1549	1.2001
141	2.6252	0.5993	1.6781	4.1067
143	1.7608	0.3027	1.2571	2.4662
151	6.9944	7.4765	0.8608	56.8352
155	1.5782	0.2206	1.2000	2.0756
156	1.8377	0.8249	0.7624	4.4295
158	$>10^4$	$>10^4$	$\leq 10^{-4}$	$>10^4$
159	16.1549	18.4740	1.7175	151.9503
161	6.0584	2.6311	2.5864	14.1913
163	3.7535	0.3428	3.1383	4.4893
164	1.8116	0.2539	1.3766	2.3842
165	7.9858	2.9810	3.8422	16.5983
168	1.0000	0.8165	0.2018	4.9545
171	4.5496	0.8731	3.1233	6.6271
172	1.8243	0.7952	0.7763	4.2870

173	1804.4300	$> 10^4$	$\leq 10^{-4}$	$> 10^4$
176	0.8517	0.5136	0.2612	2.7772
177	$\leq 10^{-4}$	0.0016	$\leq 10^{-4}$	$> 10^4$
180	$\leq 10^{-4}$	0.0110	$\leq 10^{-4}$	$> 10^4$
181	0.8577	0.1792	0.5694	1.2918
190	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
191	0.3333	0.3849	0.0347	3.2045
192	4.4118	2.8055	1.2686	15.3426
193	4.7113	0.6747	3.5584	6.2379
194	1.4083	0.5282	0.6752	2.9374
196	0.9993	0.9993	0.1407	7.0946
197	7.7013	1.4705	5.2971	11.1969
205	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	$> 10^4$
211	0.0002	0.0080	$\leq 10^{-4}$	$> 10^4$
212	$\leq 10^{-4}$	0.0022	$\leq 10^{-4}$	$> 10^4$
229	1.5392	0.6924	0.6374	3.7172
242	3755.7482	$> 10^4$	$\leq 10^{-4}$	$> 10^4$
301	1.4737	0.2246	1.0932	1.9866
310	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	$> 10^4$
312	3.7417	1.1553	2.0429	6.8533
313	4.6673	1.2572	2.7529	7.9131
316	4723.7681	$> 10^4$	$\leq 10^{-4}$	$> 10^4$
317	0.4338	0.2974	0.1131	1.6630
319	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	$> 10^4$
320	1626.0345	$> 10^4$	$\leq 10^{-4}$	$> 10^4$
324	1.9422	1.2026	0.5771	6.5369
325	8212.8934	$> 10^4$	$\leq 10^{-4}$	$> 10^4$
380	$\leq 10^{-4}$	0.0067	$\leq 10^{-4}$	$> 10^4$
390	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	$> 10^4$
401	3.0341	0.3758	2.3801	3.8678
435	0.0004	0.0202	$\leq 10^{-4}$	$> 10^4$
452	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
502	1.1601	0.1307	0.9303	1.4467
503	1.5124	0.1415	1.2590	1.8167
506	9.8158	5.1927	3.4804	27.6836
511	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
512	6.1816	2.3945	2.8932	13.2077
517	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
604	2.3128	1.8504	0.4821	11.0960
616	$\leq 10^{-4}$	0.0002	$\leq 10^{-4}$	∞
735	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	$> 10^4$
795	0.2171	0.2419	0.0244	1.9285
820	3696.6591	$> 10^4$	$\leq 10^{-4}$	$> 10^4$

Table 29. Using model $M_{2,2}$, species-specific MLEs of ρ for survey stations, standard errors, and 95% confidence intervals.

SVSPP	$\widehat{\rho}$	$SE(\widehat{\rho})$	$CI_L(\widehat{\rho})$	$CI_U(\widehat{\rho})$
1	1.0903	0.3482	0.5830	2.0390
13	1.2987	0.1976	0.9638	1.7499
14	3.6878	1.0479	2.1130	6.4364
15	1.2018	0.0611	1.0878	1.3277
22	4.0253	0.6458	2.9393	5.5126
23	3.5867	0.3416	2.9759	4.3229
26	6.9268	0.5578	5.9154	8.1111
27	3.7486	0.7631	2.5153	5.5864
28	4.5617	0.9546	3.0269	6.8747
30	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
31	1.2447	0.2586	0.8283	1.8703
32	2.2343	0.2342	1.8195	2.7439
33	1.7099	0.1747	1.3995	2.0891
34	1.7485	0.3058	1.2410	2.4635
35	1.4797	0.3203	0.9682	2.2616
36	2.7076	1.3804	0.9969	7.3542
43	0.2552	0.0717	0.1472	0.4426
46	1.5455	0.7473	0.5991	3.9870
56	0.6546	0.1741	0.3887	1.1024
60	0.1250	0.1326	0.0156	0.9994
72	5.0293	0.2600	4.5448	5.5656
73	2.0726	0.2797	1.5909	2.7002
74	1.7279	0.1650	1.4330	2.0835
75	0.7495	0.1879	0.4585	1.2252
76	2.2618	0.2181	1.8723	2.7323
77	3.1137	0.2280	2.6975	3.5942
78	3.7055	0.3195	3.1293	4.3878
79	3.6960	1.8041	1.4198	9.6210
83	5.9135	1.6631	3.4076	10.2622
84	2.8534	1.2795	1.1849	6.8714
87	0.8750	0.4529	0.3173	2.4130
101	0.8989	0.3058	0.4614	1.7511
102	2.1222	0.1232	1.8940	2.3779
103	2.6948	0.2111	2.3113	3.1419
104	3.7074	0.2789	3.1991	4.2965
105	2.2850	0.2118	1.9054	2.7403
106	2.6285	0.3086	2.0881	3.3086
107	3.0262	0.3398	2.4283	3.7712

108	2.9161	0.2764	2.4217	3.5114
109	6.0086	0.9025	4.4764	8.0653
112	3.2666	0.9641	1.8318	5.8254
113	0.2781	0.1425	0.1018	0.7593
116	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞
117	2.7583	0.7449	1.6248	4.6828
121	1.3837	0.2153	1.0200	1.8770
131	1.7936	0.1366	1.5449	2.0824
135	1.2408	0.1896	0.9196	1.6741
139	0.8451	0.1483	0.5992	1.1920
141	3.7657	0.7029	2.6120	5.4291
143	2.9307	0.3747	2.2811	3.7652
151	0.9998	1.4141	0.0625	15.9873
155	1.3853	0.1571	1.1091	1.7302
156	2.9449	0.5672	2.0189	4.2954
158	7.1033	4.1502	2.2601	22.3245
159	2.7087	1.6550	0.8179	8.9709
161	3.2281	1.2028	1.5553	6.7003
163	3.3466	0.2275	2.9291	3.8234
164	1.8026	0.1961	1.4564	2.2310
165	1.5050	0.4876	0.7975	2.8401
171	4.1209	0.5897	3.1130	5.4552
172	3.1963	0.6803	2.1060	4.8510
176	3.3100	1.5876	1.2929	8.4739
180	0.5000	0.6124	0.0453	5.5139
181	0.2994	0.0719	0.1870	0.4795
192	2.5001	2.0918	0.4850	12.8866
193	4.2589	0.5833	3.2562	5.5704
194	2.0687	0.4403	1.3630	3.1396
196	4.0016	0.6598	2.8965	5.5282
197	6.8685	0.9348	5.2603	8.9683
205	10.0026	10.4919	1.2802	78.1552
211	1.1363	0.3540	0.6170	2.0927
212	1.2308	0.3379	0.7186	2.1081
229	0.2356	0.1638	0.0603	0.9201
301	1.5835	0.1416	1.3290	1.8869
310	5.7734	2.1062	2.8243	11.8020
312	2.5902	0.4853	1.7941	3.7395
313	2.9050	0.3610	2.2771	3.7062
316	8.3089	5.6204	2.2068	31.2842
317	3.5762	1.1167	1.9392	6.5951
319	3.5568	1.4257	1.6213	7.8027
324	2.0097	1.1025	0.6858	5.8896
325	3.5001	2.8064	0.7271	16.8488
380	0.9997	1.4138	0.0625	15.9836
390	1.8198	0.6852	0.8700	3.8065

401	3.4690	0.3172	2.8997	4.1499
452	$> 10^4$	$> 10^4$	$\leq 10^{-4}$	∞
502	1.5774	0.1540	1.3027	1.9101
503	1.7744	0.1134	1.5654	2.0112
506	16.5083	4.2477	9.9698	27.3352
512	1.6890	0.3064	1.1836	2.4101
517	$\leq 10^{-4}$	0.0002	$\leq 10^{-4}$	∞
604	1.0001	1.4144	0.0626	15.9897
616	$> 10^4$	$> 10^4$	$> 10^4$	$> 10^4$
735	0.8526	0.7819	0.1413	5.1445
795	2.8696	1.0949	1.3584	6.0618
820	5.7230	4.3046	1.3103	24.9956

Table 30. Using model $M_{2,2}$, species-specific MLEs of ρ for site-specific stations, standard errors, and 95% confidence intervals.

SVSPP	$\hat{\rho}$	$SE(\hat{\rho})$	$CI_L(\hat{\rho})$	$CI_U(\hat{\rho})$
1	1.5154	0.5558	0.7384	3.1099
13	0.7256	0.1805	0.4456	1.1816
14	4.0905	1.7579	1.7618	9.4970
15	1.0722	0.0625	0.9563	1.2021
22	4.9664	0.8477	3.5543	6.9395
23	3.3560	0.3775	2.6920	4.1838
26	8.2314	0.8904	6.6589	10.1753
27	5.7054	1.0407	3.9905	8.1575
28	3.4715	0.6600	2.3917	5.0389
31	0.2501	0.2797	0.0279	2.2390
32	1.8788	0.2450	1.4551	2.4258
33	1.0129	0.1983	0.6901	1.4867
34	0.9087	0.2322	0.5507	1.4994
35	1.9479	0.5902	1.0756	3.5277
36	$\leq 10^{-4}$	0.0113	$\leq 10^{-4}$	$> 10^4$
43	0.1249	0.1325	0.0156	0.9992
46	6316.5928	$> 10^4$	$\leq 10^{-4}$	$> 10^4$
56	0.0156	0.0157	0.0022	0.1127
60	0.5001	0.6124	0.0453	5.5145
72	4.3095	0.3257	3.7162	4.9976
73	1.9000	0.2682	1.4408	2.5054
74	1.2191	0.0942	1.0478	1.4183
75	0.9967	0.2892	0.5644	1.7601
76	2.1878	0.2826	1.6984	2.8182
77	3.3235	0.2884	2.8036	3.9397
78	1.6758	0.3069	1.1704	2.3995

79	11.9936	12.4873	1.5585	92.2965
83	7.4165	2.6972	3.6361	15.1272
84	8.0008	6.0010	1.8394	34.8000
87	1.5000	1.3693	0.2506	8.9772
101	0.6671	0.6090	0.1115	3.9921
102	1.8387	0.1419	1.5806	2.1389
103	1.3894	0.1518	1.1215	1.7212
104	3.9910	0.3672	3.3325	4.7796
105	1.7850	0.1800	1.4649	2.1751
106	2.4050	0.2844	1.9076	3.0323
107	3.8429	0.8662	2.4705	5.9777
108	2.2225	0.4236	1.5297	3.2289
109	18.6461	2.9282	13.7061	25.3666
112	4.6662	2.9692	1.3407	16.2403
113	0.0002	0.0086	$\le 10^{-4}$	$> 10^{4}$
116	$\le 10^{-4}$	$\le 10^{-4}$	$\le 10^{-4}$	∞
117	4.6608	5.7317	0.4185	51.9073
121	0.8183	0.2042	0.5018	1.3344
131	1.0094	0.1316	0.7818	1.3034
135	0.6351	0.2605	0.2843	1.4188
139	0.4508	0.2430	0.1567	1.2968
141	2.8575	0.6440	1.8371	4.4446
143	1.7890	0.2751	1.3236	2.4182
151	6.9994	7.4827	0.8612	56.8895
155	1.5677	0.2254	1.1827	2.0781
156	1.6955	0.8500	0.6348	4.5290
158	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	$> 10^{4}$
159	38.9813	39.4957	5.3508	283.9814
161	5.2320	2.5582	2.0066	13.6418
163	3.6171	0.3688	2.9619	4.4172
164	1.7839	0.2611	1.3390	2.3765
165	8.7534	3.4884	4.0083	19.1158
171	5.8456	0.7992	4.4714	7.6420
172	2.2776	0.6442	1.3083	3.9648
176	0.7271	0.4672	0.2063	2.5621
180	$\le 10^{-4}$	$\le 10^{-4}$	$\le 10^{-4}$	$\le 10^{-4}$
181	0.8503	0.1795	0.5621	1.2861
192	4.2512	2.3634	1.4299	12.6391
193	5.0794	0.6856	3.8988	6.6175
194	1.5240	0.5681	0.7339	3.1643
196	1.0001	1.0001	0.1409	7.1002
197	7.6611	1.4871	5.2368	11.2079
205	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	$> 10^{4}$
211	$\le 10^{-4}$	0.0032	$\le 10^{-4}$	$> 10^{4}$
212	$\le 10^{-4}$	0.0021	$\le 10^{-4}$	$> 10^{4}$

229	1.5453	0.6814	0.6511	3.6674
301	1.4421	0.2334	1.0501	1.9806
312	3.3537	1.0835	1.7803	6.3173
313	4.8913	1.3928	2.7993	8.5467
316	2901.8474	$>10^4$	$\leq 10^{-4}$	$>10^4$
317	0.4287	0.2958	0.1109	1.6576
319	$>10^4$	$>10^4$	$\leq 10^{-4}$	$>10^4$
324	1.9995	1.2246	0.6020	6.6411
325	$>10^4$	$>10^4$	$\leq 10^{-4}$	$>10^4$
380	$\leq 10^{-4}$	0.0102	$\leq 10^{-4}$	$>10^4$
390	$>10^4$	$>10^4$	$\leq 10^{-4}$	$>10^4$
401	2.8596	0.3815	2.2017	3.7141
452	$>10^4$	$\leq 10^{-4}$	$>10^4$	$>10^4$
502	1.1678	0.1340	0.9325	1.4624
503	1.5138	0.1402	1.2624	1.8152
506	4.2507	2.3624	1.4302	12.6335
512	5.0029	2.1106	2.1883	11.4375
517	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞
604	2.3182	1.8531	0.4839	11.1068
616	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$
735	$>10^4$	$>10^4$	$\leq 10^{-4}$	$>10^4$
795	0.2500	0.2795	0.0279	2.2366
820	4835.5047	0.0030	4835.4988	4835.5106

Table 31. Using model $M_{2,3}$, species-specific MLEs of ρ for survey stations, standard errors, and 95% confidence intervals.

SVSPP	$\widehat{\rho}$	$SE(\widehat{\rho})$	$CI_L(\widehat{\rho})$	$CI_U(\widehat{\rho})$
1	0.9871	0.3277	0.5150	1.8920
13	1.3173	0.1989	0.9799	1.7709
14	3.6532	1.0621	2.0664	6.4586
15	1.2029	0.0611	1.0890	1.3288
21	2.0000	1.7320	0.3663	10.9191
22	4.1564	0.6635	3.0397	5.6832
23	3.4475	0.3119	2.8873	4.1162
26	7.3294	0.6327	6.1885	8.6806
27	3.8272	0.8287	2.5036	5.8505
28	4.3799	0.9293	2.8898	6.6384
31	1.2394	0.2582	0.8239	1.8643
32	2.1085	0.1941	1.7605	2.5253
33	1.6995	0.1784	1.3834	2.0879
34	1.7594	0.3046	1.2531	2.4702

35	1.4735	0.3194	0.9635	2.2534
36	3.2894	1.8500	1.0924	9.9049
43	0.2242	0.0619	0.1306	0.3851
46	1.8110	0.9118	0.6750	4.8585
56	0.7150	0.1949	0.4192	1.2198
60	0.1250	0.1326	0.0156	0.9994
72	4.9633	0.2625	4.4745	5.5054
73	2.2044	0.3131	1.6688	2.9119
74	1.7161	0.1629	1.4247	2.0671
75	0.7659	0.1842	0.4781	1.2271
76	2.2320	0.2183	1.8427	2.7037
77	3.0935	0.2307	2.6728	3.5804
78	3.7024	0.3197	3.1260	4.3851
79	4.4067	1.5244	2.2370	8.6811
83	4.3602	1.3385	2.3889	7.9581
87	0.8749	0.4528	0.3173	2.4127
101	0.9375	0.3361	0.4643	1.8929
102	2.1242	0.1227	1.8968	2.3788
103	2.8296	0.2165	2.4355	3.2875
104	3.6648	0.2874	3.1427	4.2736
105	2.3619	0.1791	2.0357	2.7403
106	2.6496	0.3120	2.1035	3.3374
107	3.0254	0.3462	2.4176	3.7860
108	3.0597	0.2763	2.5635	3.6521
109	6.4960	1.1397	4.6057	9.1620
112	3.2665	0.9643	1.8314	5.8259
113	0.2781	0.1425	0.1018	0.7592
117	2.4163	0.6209	1.4602	3.9984
121	1.4778	0.2265	1.0944	1.9955
131	1.8041	0.1377	1.5535	2.0951
135	1.2360	0.1903	0.9141	1.6712
139	0.8572	0.1509	0.6071	1.2104
141	3.8049	0.7159	2.6315	5.5017
143	2.8645	0.3523	2.2508	3.6454
155	1.3838	0.1565	1.1087	1.7273
156	2.6519	0.4923	1.8430	3.8158
158	6.8330	3.9789	2.1824	21.3933
161	3.2171	1.2304	1.5203	6.8078
163	3.3438	0.2307	2.9209	3.8280
164	1.7937	0.2115	1.4236	2.2600
165	1.7789	0.5575	0.9625	3.2879
168	3.3396	1.3870	1.4797	7.5373
171	4.4256	0.6207	3.3620	5.8257
172	3.2533	0.6986	2.1358	4.9556
176	3.0539	1.4609	1.1958	7.7992
180	0.5000	0.6123	0.0453	5.5139

181	0.3190	0.0754	0.2006	0.5071
192	2.5000	2.0917	0.4850	12.8858
193	4.3134	0.6149	3.2620	5.7038
194	2.1042	0.4915	1.3312	3.3260
196	4.0008	0.6612	2.8938	5.5312
197	7.4026	0.9773	5.7148	9.5887
212	1.3032	0.3565	0.7623	2.2278
229	0.0542	0.0542	0.0076	0.3844
301	1.5808	0.1427	1.3245	1.8867
310	5.2043	2.0332	2.4200	11.1919
312	2.5044	0.4557	1.7531	3.5776
313	2.8228	0.3555	2.2054	3.6131
316	8.0203	4.5566	2.6339	24.4222
317	3.8289	1.2618	2.0070	7.3046
319	6.7709	2.4966	3.2869	13.9479
320	5.3122	1.6307	2.9106	9.6956
325	3.5001	2.8060	0.7272	16.8459
390	2.0023	0.7757	0.9370	4.2786
401	3.4273	0.3106	2.8695	4.0935
435	4.9773	1.3337	2.9438	8.4154
502	1.6042	0.1566	1.3249	1.9424
503	1.7590	0.1120	1.5526	1.9928
506	16.2796	4.2581	9.7499	27.1822
512	1.6655	0.2993	1.1711	2.3686
517	$\leq 10^{-4}$	0.0002	$\leq 10^{-4}$	∞
604	1.0001	1.4144	0.0626	15.9897
735	0.8526	0.7819	0.1413	5.1446
795	2.9767	1.1551	1.3913	6.3685

Table 32. Using model $M_{2,3}$, species-specific MLEs of ρ for site-specific stations, standard errors, and 95% confidence intervals.

SVSPP	$\widehat{\rho}$	$SE(\widehat{\rho})$	$CI_L(\widehat{\rho})$	$CI_U(\widehat{\rho})$
1	1.5154	0.5558	0.7384	3.1099
13	0.7256	0.1805	0.4456	1.1816
14	4.0905	1.7579	1.7618	9.4969
15	1.0722	0.0625	0.9563	1.2021
21	$\leq 10^{-4}$	0.0006	$\leq 10^{-4}$	∞
22	4.9666	0.8477	3.5545	6.9397
23	3.3547	0.3773	2.6909	4.1821
26	8.2299	0.8902	6.6577	10.1733
27	5.7053	1.0405	3.9906	8.1568
28	3.4718	0.6600	2.3918	5.0393

30	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$
31	0.2500	0.2796	0.0279	2.2378
32	1.8788	0.2450	1.4551	2.4258
33	1.0131	0.1984	0.6902	1.4870
34	0.9087	0.2322	0.5507	1.4994
35	1.9479	0.5902	1.0756	3.5277
36	0.0002	0.0134	$\leq 10^{-4}$	$> 10^{4}$
43	0.1248	0.1325	0.0156	0.9991
46	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	$> 10^{4}$
56	0.0156	0.0158	0.0022	0.1127
60	0.5000	0.6124	0.0453	5.5141
72	4.3110	0.3259	3.7173	4.9995
73	1.9001	0.2682	1.4409	2.5055
74	1.2186	0.0941	1.0474	1.4179
75	0.9967	0.2892	0.5644	1.7601
76	2.1877	0.2827	1.6983	2.8182
77	3.3243	0.2886	2.8042	3.9408
78	1.6758	0.3069	1.1704	2.3994
79	11.9981	12.4887	1.5600	92.2818
83	7.4162	2.6977	3.6354	15.1289
87	1.4999	1.3692	0.2506	8.9761
101	0.6666	0.6085	0.1114	3.9893
102	1.8388	0.1419	1.5807	2.1391
103	1.3894	0.1518	1.1215	1.7212
104	3.9909	0.3672	3.3324	4.7794
105	1.7850	0.1800	1.4649	2.1750
106	2.4046	0.2843	1.9072	3.0318
107	3.8430	0.8663	2.4705	5.9778
108	2.2205	0.4230	1.5286	3.2255
109	18.6487	2.9289	13.7076	25.3709
112	4.6659	2.9696	1.3403	16.2433
113	$\leq 10^{-4}$	0.0131	$\leq 10^{-4}$	$> 10^{4}$
117	4.6638	5.7318	0.4194	51.8631
121	0.8183	0.2042	0.5018	1.3344
131	1.0094	0.1316	0.7818	1.3033
135	0.6351	0.2605	0.2843	1.4188
139	0.4507	0.2430	0.1567	1.2965
141	2.8572	0.6440	1.8369	4.4443
143	1.7889	0.2750	1.3235	2.4180
155	1.5677	0.2254	1.1827	2.0780
156	1.6954	0.8499	0.6347	4.5288
158	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	$> 10^{4}$
161	5.2320	2.5582	2.0066	13.6418
163	3.6168	0.3688	2.9616	4.4168
164	1.7837	0.2610	1.3389	2.3763
165	8.7532	3.4882	4.0082	19.1152

168	1.0000	0.8165	0.2018	4.9545
171	5.8454	0.7992	4.4714	7.6418
172	2.2775	0.6443	1.3082	3.9650
176	0.7270	0.4672	0.2063	2.5620
181	0.8503	0.1795	0.5621	1.2861
192	4.2503	2.3626	1.4297	12.6352
193	5.0793	0.6856	3.8986	6.6175
194	1.5239	0.5681	0.7339	3.1642
196	1.0000	1.0000	0.1409	7.0994
197	7.6604	1.4869	5.2363	11.2066
212	$\le 10^{-4}$	0.0008	$\le 10^{-4}$	$> 10^{4}$
229	1.5456	0.6816	0.6512	3.6681
301	1.4421	0.2334	1.0501	1.9805
310	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	$> 10^{4}$
312	3.3536	1.0835	1.7803	6.3171
313	4.8912	1.3928	2.7993	8.5466
316	3753.8213	$> 10^{4}$	$\le 10^{-4}$	$> 10^{4}$
317	0.4285	0.2957	0.1108	1.6572
319	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	$> 10^{4}$
320	$> 10^{4}$	$> 10^{4}$	$> 10^{4}$	$> 10^{4}$
325	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	∞
390	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	$> 10^{4}$
401	2.8596	0.3815	2.2017	3.7141
502	1.1678	0.1340	0.9325	1.4624
503	1.5138	0.1403	1.2624	1.8152
506	4.2542	2.3649	1.4310	12.6473
512	5.0030	2.1107	2.1884	11.4377
517	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	∞
604	2.3204	1.8543	0.4845	11.1117
735	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	$> 10^{4}$
795	0.2500	0.2795	0.0279	2.2366

Table 33. Using model $M_{3,1}$, species-specific MLEs of ρ for spring stations, standard errors, and 95% confidence intervals.

SVSPP	$\widehat{\rho}$	$SE(\widehat{\rho})$	$CI_L(\widehat{\rho})$	$CI_U(\widehat{\rho})$
1	3.4615	2.3237	0.9287	12.9024
13	1.8793	0.5396	1.0706	3.2991
14	5.9494	2.3698	2.7254	12.9874
15	1.2016	0.0780	1.0580	1.3646
21	1.9998	2.4492	0.1813	22.0530
22	3.1732	0.7442	2.0038	5.0250

23	4.1615	0.5583	3.1993	5.4130
24	7.8159	1.6312	5.1919	11.7660
26	5.4162	0.5575	4.4267	6.6268
27	2.2912	0.5905	1.3826	3.7971
28	3.0008	0.9186	1.6470	5.4676
31	0.4876	0.4335	0.0854	2.7850
32	2.6812	0.3593	2.0618	3.4866
33	1.4049	0.2176	1.0371	1.9031
34	1.5673	0.3208	1.0493	2.3410
35	1.4695	0.4154	0.8445	2.5573
36	0.7220	0.7273	0.1002	5.2005
43	0.2904	0.1253	0.1247	0.6764
46	0.3784	0.2869	0.0856	1.6725
56	0.3561	0.1463	0.1591	0.7968
60	$\leq 10^{-4}$	0.0013	$\leq 10^{-4}$	$> 10^{4}$
72	5.8881	0.5157	4.9594	6.9908
73	1.8402	0.3308	1.2937	2.6175
74	1.6210	0.2167	1.2473	2.1066
75	0.7508	0.2988	0.3442	1.6378
76	2.5154	0.4304	1.7988	3.5176
77	3.8838	0.4484	3.0972	4.8701
78	3.7782	0.4887	2.9322	4.8683
79	3.3041	2.2928	0.8480	12.8741
83	3.5609	1.2696	1.7705	7.1621
84	5.9992	4.5822	1.3426	26.8069
87	$\leq 10^{-4}$	0.0053	$\leq 10^{-4}$	$> 10^{4}$
101	1.1920	0.7331	0.3571	3.9790
102	2.0552	0.2295	1.6512	2.5581
103	3.0920	0.3712	2.4437	3.9123
104	4.3764	0.5209	3.4657	5.5264
105	2.3991	0.3232	1.8424	3.1241
106	2.7749	0.5028	1.9453	3.9581
107	2.8177	0.4747	2.0254	3.9200
108	3.2754	0.4480	2.5052	4.2824
109	10.5022	2.0681	7.1394	15.4488
112	1.4998	1.3692	0.2506	8.9761
113	0.2781	0.1425	0.1019	0.7592
117	1.8525	0.5515	1.0335	3.3202
121	1.2641	0.2447	0.8649	1.8474
131	1.5044	0.2154	1.1364	1.9917
135	2.9439	2.0462	0.7538	11.4968
139	0.9538	0.4646	0.3671	2.4781
141	2.5700	0.6977	1.5096	4.3753
143	4.4997	1.2074	2.6594	7.6134
155	1.3046	0.2774	0.8599	1.9791
156	2.4168	0.5656	1.5277	3.8233

158	9.3589	7.0039	2.1588	40.5729
161	1.8773	0.9282	0.7123	4.9476
163	3.4899	0.3727	2.8309	4.3024
164	1.4857	0.2321	1.0938	2.0180
165	0.5288	0.2960	0.1765	1.5842
168	$>10^4$	$>10^4$	$\leq 10^{-4}$	$>10^4$
171	6.1442	1.2716	4.0955	9.2177
172	3.2164	1.1529	1.5931	6.4937
173	2.3303	1.2589	0.8083	6.7184
176	$>10^4$	$>10^4$	$\leq 10^{-4}$	$>10^4$
177	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞
180	$\leq 10^{-4}$	0.0031	$\leq 10^{-4}$	$>10^4$
181	0.2600	0.0801	0.1422	0.4754
191	11.0461	12.4466	1.2136	100.5373
192	4380.3170	$>10^4$	$\leq 10^{-4}$	$>10^4$
193	5.1802	0.8888	3.7008	7.2508
194	1.3530	0.4417	0.7135	2.5656
196	5.4982	4.2265	1.2187	24.8051
197	7.8345	1.8573	4.9228	12.4683
211	$\leq 10^{-4}$	0.0108	$\leq 10^{-4}$	$>10^4$
212	$\leq 10^{-4}$	0.0034	$\leq 10^{-4}$	$>10^4$
229	0.3139	0.3582	0.0335	2.9388
242	0.9135	0.8797	0.1384	6.0311
301	1.5872	0.2437	1.1748	2.1445
310	5.6520	3.6789	1.5781	20.2422
312	2.4280	0.9055	1.1690	5.0429
313	3.5202	0.5966	2.5253	4.9071
316	4.7509	4.2637	0.8182	27.5863
317	2.1415	0.9094	0.9317	4.9223
319	3.6697	1.7895	1.4111	9.5435
320	22.2164	17.0038	4.9567	99.5769
324	0.0002	0.0137	$\leq 10^{-4}$	$>10^4$
325	$>10^4$	$>10^4$	$\leq 10^{-4}$	∞
380	1.0000	1.4142	0.0625	15.9873
390	4.4187	4.5965	0.5752	33.9425
401	4.0429	0.5758	3.0582	5.3448
435	1.6870	0.8578	0.6227	4.5702
502	2.3091	0.5629	1.4320	3.7236
503	2.0817	0.2355	1.6678	2.5984
506	14.8223	4.3057	8.3879	26.1926
512	1.2817	0.3905	0.7054	2.3288
517	$\leq 10^{-4}$	$\leq 10^{-4}$	$\leq 10^{-4}$	∞
604	4319.0840	$>10^4$	$\leq 10^{-4}$	$>10^4$
735	1.3422	1.2872	0.2049	8.7932
795	0.8230	0.5344	0.2305	2.9386

Table 34. Using model $M_{3,1}$, species-specific MLEs of ρ for fall stations, standard errors, and 95% confidence intervals.

SVSPP	$\widehat{\rho}$	$SE(\widehat{\rho})$	$CI_L(\widehat{\rho})$	$CI_U(\widehat{\rho})$
1	0.7152	0.2647	0.3463	1.4772
13	1.1183	0.1935	0.7966	1.5698
14	2.6378	0.9259	1.3258	5.2482
15	1.2038	0.0956	1.0302	1.4066
21	1.9989	2.4479	0.1813	22.0393
22	4.8174	0.8876	3.3572	6.9126
23	3.0823	0.3999	2.3903	3.9747
24	6.2209	0.9634	4.5923	8.4271
26	8.8305	0.9709	7.1186	10.9540
27	5.9995	1.6300	3.5225	10.2183
28	5.6101	1.8069	2.9841	10.5470
31	1.3128	0.2809	0.8631	1.9970
32	1.7427	0.2659	1.2922	2.3503
33	1.9920	0.4884	1.2320	3.2209
34	1.3356	0.6187	0.5387	3.3114
35	1.6219	0.6581	0.7323	3.5924
36	4.4228	2.8900	1.2288	15.9185
43	0.2566	0.0848	0.1343	0.4905
46	9.6702	10.3854	1.1784	79.3580
56	0.9096	0.2887	0.4883	1.6942
60	6526.9166	$>10^4$	$\leq 10^{-4}$	$>10^4$
72	4.1137	0.2822	3.5962	4.7057
73	2.3623	0.4699	1.5996	3.4886
74	1.8564	0.2287	1.4581	2.3635
75	0.7351	0.2403	0.3874	1.3951
76	2.1503	0.2489	1.7139	2.6979
77	2.6685	0.2411	2.2354	3.1855
78	3.5425	0.4111	2.8218	4.4473
79	4.4903	2.6192	1.4315	14.0857
83	10.4195	4.6165	4.3723	24.8306
84	1.5999	0.9121	0.5234	4.8906
87	1.1666	0.6490	0.3921	3.4711
101	0.6338	0.3490	0.2154	1.8651
102	2.1788	0.1905	1.8358	2.5861
103	2.4647	0.2416	2.0339	2.9868
104	3.3437	0.3017	2.8018	3.9905
105	2.1832	0.2782	1.7007	2.8027
106	2.6574	0.3703	2.0223	3.4919

107	3.2093	0.5297	2.3223	4.4351
108	2.6227	0.3250	2.0571	3.3438
109	4.9299	0.8267	3.5489	6.8482
112	3.5383	1.1116	1.9115	6.5493
117	7.6014	3.9646	2.7348	21.1276
121	1.6357	0.4459	0.9587	2.7909
131	1.8673	0.1704	1.5615	2.2331
135	1.1872	0.1838	0.8764	1.6082
139	1.2270	1.0916	0.2146	7.0167
141	4.9430	1.0697	3.2344	7.5543
143	2.7417	0.3658	2.1109	3.5610
155	1.4094	0.1936	1.0767	1.8449
156	4.0336	1.2868	2.1584	7.5377
158	4.8879	3.8832	1.0301	23.1933
161	3.6428	1.5844	1.5531	8.5439
163	3.0862	0.3469	2.4761	3.8468
164	2.1446	0.3328	1.5822	2.9069
165	2.6150	1.0549	1.1860	5.7658
168	2.6859	1.1284	1.1789	6.1194
171	3.5221	0.5834	2.5457	4.8730
172	3.2690	0.8286	1.9892	5.3723
173	3.8480	3.0752	0.8035	18.4285
176	2.5488	1.2776	0.9542	6.8076
177	3.4997	2.8060	0.7270	16.8465
180	1.0000	1.4142	0.0625	15.9869
181	0.5720	0.1786	0.3101	1.0550
191	3.2737	2.6205	0.6818	15.7184
192	1.1149	0.9861	0.1970	6.3105
193	3.7422	0.6735	2.6298	5.3251
194	2.6662	0.6696	1.6298	4.3619
196	3.9342	0.6587	2.8336	5.4621
197	6.3752	1.0518	4.6139	8.8090
211	1.1975	0.3791	0.6438	2.2271
212	1.8350	0.5456	1.0246	3.2865
229	0.1562	0.1281	0.0313	0.7789
242	$\leq 10^{-4}$	0.0046	$\leq 10^{-4}$	$> 10^{4}$
301	1.5809	0.1812	1.2629	1.9790
310	5.8329	2.5868	2.4456	13.9117
312	2.4354	0.5064	1.6201	3.6608
313	2.4750	0.3954	1.8096	3.3849
316	11.1618	8.6813	2.4305	51.2590
317	5.4526	2.4524	2.2582	13.1658
319	3.4061	1.8843	1.1517	10.0731
320	4.7958	1.7008	2.3933	9.6102
324	2.5263	1.4082	0.8473	7.5327
325	2.5000	2.0917	0.4850	12.8859

380	0.0156	522.2008	$\leq 10^{-4}$	∞
390	1.3425	0.6323	0.5334	3.3791
401	2.8893	0.3375	2.2981	3.6326
435	5.9084	1.8036	3.2481	10.7475
502	1.4485	0.1566	1.1719	1.7903
503	1.6492	0.1260	1.4199	1.9156
506	33.9728	34.4932	4.6440	248.5260
512	1.9669	0.4560	1.2487	3.0982
604	0.0003	0.0184	$\leq 10^{-4}$	$> 10^{4}$
735	0.0003	0.0171	$\leq 10^{-4}$	$> 10^{4}$
795	4.5406	2.1579	1.7889	11.5253

Table 35. Using model $M_{3,2}$, species-specific MLEs of ρ for spring stations, standard errors, and 95% confidence intervals.

SVSPP	$\widehat{\rho}$	$SE(\widehat{\rho})$	$CI_L(\widehat{\rho})$	$CI_U(\widehat{\rho})$
1	3.2972	2.2577	0.8616	12.6181
13	1.9001	0.5648	1.0612	3.4024
14	5.6961	2.3594	2.5293	12.8280
15	1.2004	0.0789	1.0553	1.3655
21	2.0002	2.4498	0.1814	22.0595
22	3.1118	0.7902	1.8917	5.1188
23	4.1636	0.5617	3.1962	5.4238
26	5.4207	0.5591	4.4284	6.6352
27	2.3298	0.6551	1.3427	4.0427
28	3.3869	0.9515	1.9529	5.8739
31	0.4896	0.4358	0.0856	2.8020
32	2.6914	0.3676	2.0593	3.5176
33	1.5233	0.1815	1.2061	1.9240
34	1.8006	0.3417	1.2413	2.6120
35	1.4193	0.3756	0.8449	2.3840
36	0.7214	0.7268	0.1002	5.1963
43	0.2793	0.1201	0.1202	0.6489
46	0.3784	0.2869	0.0856	1.6725
56	0.3645	0.1511	0.1618	0.8212
60	$\leq 10^{-4}$	0.0014	$\leq 10^{-4}$	$> 10^{4}$
72	6.2444	0.5052	5.3287	7.3173
73	1.8446	0.3271	1.3031	2.6113
74	1.6072	0.2245	1.2223	2.1132
75	0.7641	0.3011	0.3530	1.6542
76	2.5200	0.4308	1.8025	3.5230
77	3.9074	0.4512	3.1159	4.8998
78	3.8466	0.4890	2.9984	4.9349

79	3.1375	2.2024	0.7927	12.4190
83	3.7172	1.3467	1.8274	7.5611
87	$\le 10^{-4}$	0.0026	$\le 10^{-4}$	$> 10^{4}$
101	1.4986	0.7910	0.5326	4.2169
102	2.0665	0.2028	1.7050	2.5047
103	3.0739	0.3753	2.4198	3.9049
104	4.3406	0.5344	3.4101	5.5251
105	2.3995	0.3228	1.8433	3.1235
106	2.7320	0.5173	1.8850	3.9596
107	2.7927	0.4460	2.0421	3.8191
108	3.2553	0.4549	2.4754	4.2809
109	8.5204	1.7967	5.6360	12.8810
112	1.5000	1.3693	0.2506	8.9770
113	0.2781	0.1425	0.1019	0.7592
117	1.8438	0.5513	1.0262	3.3129
121	1.2689	0.2464	0.8673	1.8565
131	1.5331	0.2143	1.1657	2.0163
135	2.9095	2.0261	0.7432	11.3911
139	0.8383	0.1507	0.5893	1.1923
141	2.5005	0.6985	1.4462	4.3233
143	4.3157	1.1837	2.5211	7.3878
155	1.3162	0.2752	0.8737	1.9828
156	2.4270	0.5609	1.5430	3.8174
158	9.3589	7.0036	2.1589	40.5705
161	2.2246	1.0786	0.8601	5.7541
163	3.5604	0.3318	2.9661	4.2737
164	1.4803	0.2215	1.1040	1.9849
165	0.5296	0.2998	0.1747	1.6061
168	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	$> 10^{4}$
171	5.7145	1.2496	3.7226	8.7722
172	3.1237	1.1360	1.5314	6.3713
176	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	$> 10^{4}$
177	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	∞
180	$\le 10^{-4}$	0.0055	$\le 10^{-4}$	$> 10^{4}$
181	0.1854	0.0608	0.0975	0.3525
192	$> 10^{4}$	$> 10^{4}$	$\le 10^{-4}$	$> 10^{4}$
193	4.8345	0.8902	3.3698	6.9357
194	1.3541	0.4494	0.7065	2.5950
196	5.4998	4.2278	1.2190	24.8135
197	7.9241	1.8841	4.9723	12.6282
211	$\le 10^{-4}$	0.0020	$\le 10^{-4}$	∞
212	$\le 10^{-4}$	0.0020	$\le 10^{-4}$	$> 10^{4}$
229	0.3200	0.3680	0.0336	3.0487
242	0.9136	0.8798	0.1384	6.0318
301	1.5758	0.2368	1.1737	2.1156

312	2.6392	0.9838	1.2711	5.4797
313	3.4896	0.6001	2.4912	4.8883
316	4.7511	4.2639	0.8182	27.5871
317	2.1519	0.9078	0.9413	4.9194
319	3.6694	1.7893	1.4110	9.5426
324	$\leq 10^{-4}$	0.0065	$\leq 10^{-4}$	$> 10^{4}$
325	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	$> 10^{4}$
390	4.4190	4.5968	0.5752	33.9459
401	4.2136	0.5887	3.2043	5.5408
502	2.3240	0.5605	1.4485	3.7285
503	2.0791	0.2362	1.6640	2.5976
506	15.3293	4.2834	8.8649	26.5077
512	1.2865	0.3876	0.7127	2.3221
604	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	$> 10^{4}$
735	1.3423	1.2873	0.2049	8.7937
795	0.8916	0.5838	0.2471	3.2173

Table 36. Using model $M_{3,2}$, species-specific MLEs of ρ for fall stations, standard errors, and 95% confidence intervals.

SVSPP	$\widehat{\rho}$	$SE(\widehat{\rho})$	$CI_L(\widehat{\rho})$	$CI_U(\widehat{\rho})$
1	0.7316	0.2752	0.3500	1.5293
13	1.1207	0.1995	0.7906	1.5888
14	2.4609	0.9108	1.1914	5.0831
15	1.2039	0.0966	1.0287	1.4090
21	1.9999	2.4493	0.1813	22.0548
22	4.6412	0.9277	3.1369	6.8670
23	3.0837	0.4033	2.3865	3.9846
26	8.8539	0.9945	7.1043	11.0343
27	5.5167	1.5729	3.1549	9.6465
28	6.2139	1.8928	3.4204	11.2888
31	1.3146	0.2816	0.8639	2.0005
32	1.7458	0.2668	1.2939	2.3554
33	2.2508	0.4256	1.5537	3.2606
34	1.4943	0.6404	0.6452	3.4612
35	1.6068	0.6026	0.7704	3.3511
36	4.4225	2.8899	1.2287	15.9179
43	0.2433	0.0804	0.1273	0.4650
46	9.6667	10.3801	1.1783	79.3053
56	0.9185	0.2940	0.4904	1.7201
60	7348.6825	$> 10^{4}$	$\leq 10^{-4}$	$> 10^{4}$
72	4.3746	0.2752	3.8671	4.9488
73	2.3908	0.4772	1.6168	3.5355

74	1.8352	0.2360	1.4263	2.3614
75	0.7399	0.2390	0.3928	1.3937
76	2.1509	0.2479	1.7161	2.6960
77	2.6843	0.2433	2.2474	3.2061
78	3.5947	0.4093	2.8758	4.4935
79	4.0957	2.4152	1.2894	13.0102
83	10.7460	4.7465	4.5214	25.5402
87	1.1667	0.6491	0.3921	3.4717
101	0.6868	0.2702	0.3177	1.4848
102	2.1528	0.1562	1.8675	2.4817
103	2.4549	0.2468	2.0158	2.9897
104	3.3587	0.3122	2.7993	4.0299
105	2.1846	0.2794	1.7002	2.8070
106	2.5688	0.3768	1.9269	3.4245
107	3.2573	0.5107	2.3955	4.4292
108	2.6432	0.3363	2.0598	3.3918
109	4.4469	0.8123	3.1086	6.3613
112	3.5385	1.1117	1.9116	6.5500
113	0.0230	1091.7639	$\leq 10^{-4}$	∞
117	7.4929	3.9193	2.6879	20.8875
121	1.6324	0.4446	0.9572	2.7840
131	1.9089	0.1711	1.6014	2.2754
135	1.1852	0.1848	0.8731	1.6089
139	0.9994	0.8160	0.2017	4.9514
141	4.7596	1.0788	3.0523	7.4218
143	2.6480	0.3707	2.0126	3.4839
155	1.4148	0.1904	1.0867	1.8419
156	4.0781	1.2900	2.1938	7.5808
158	4.8871	3.8824	1.0300	23.1877
161	4.3714	1.8374	1.9179	9.9633
163	3.1147	0.3048	2.5711	3.7732
164	2.1716	0.3244	1.6204	2.9103
165	2.5921	1.0582	1.1646	5.7697
168	2.6857	1.1283	1.1789	6.1187
171	3.2088	0.5795	2.2522	4.5717
172	3.2327	0.8342	1.9495	5.3607
176	2.5442	1.2298	0.9865	6.5613
177	3.4999	2.8062	0.7270	16.8479
180	0.9999	1.4140	0.0625	15.9856
181	0.4858	0.1500	0.2653	0.8896
192	2.0001	1.7322	0.3663	10.9204
193	3.6943	0.6979	2.5512	5.3497
194	2.6348	0.6796	1.5893	4.3683
196	3.9337	0.6575	2.8348	5.4585
197	6.3833	1.0451	4.6312	8.7984
211	1.1983	0.3794	0.6443	2.2288

212	1.8349	0.5456	1.0245	3.2862
229	0.2025	0.1736	0.0378	1.0863
242	$\leq 10^{-4}$	0.0046	$\leq 10^{-4}$	$> 10^{4}$
301	1.5878	0.1776	1.2753	1.9769
312	2.5763	0.5371	1.7122	3.8765
313	2.4611	0.3966	1.7946	3.3751
316	11.1606	8.6802	2.4303	51.2519
317	5.7183	2.6031	2.3430	13.9556
319	3.4061	1.8843	1.1517	10.0730
324	2.4947	1.4298	0.8113	7.6713
325	2.5000	2.0917	0.4850	12.8859
390	1.3424	0.6322	0.5334	3.3789
401	3.0249	0.3469	2.4159	3.7874
502	1.4549	0.1551	1.1805	1.7930
503	1.6471	0.1265	1.4168	1.9147
506	34.1334	34.6491	4.6678	249.5989
512	1.9624	0.4509	1.2509	3.0786
604	$\leq 10^{-4}$	0.0083	$\leq 10^{-4}$	$> 10^{4}$
735	0.0003	0.0175	$\leq 10^{-4}$	$> 10^{4}$
795	4.9241	2.3841	1.9063	12.7192

Table 37. Using model $M_{3,3}$, species-specific MLEs of ρ for spring stations, standard errors, and 95% confidence intervals.

SVSPP	$\hat{\rho}$	$SE(\hat{\rho})$	$CI_L(\hat{\rho})$	$CI_U(\hat{\rho})$
1	2.8608	2.0304	0.7118	11.4975
13	1.8505	0.5173	1.0698	3.2007
14	5.9391	2.4168	2.6751	13.1857
15	1.2022	0.0777	1.0591	1.3647
21	1.9999	2.4493	0.1813	22.0546
22	2.9580	0.8306	1.7061	5.1287
23	3.8220	0.5790	2.8402	5.1432
26	5.1269	0.5933	4.0865	6.4322
27	2.3152	0.6706	1.3123	4.0844
28	3.4404	0.9729	1.9764	5.9886
31	0.4219	0.3779	0.0729	2.4414
32	2.2870	0.3352	1.7160	3.0480
33	1.5226	0.1823	1.2042	1.9253
34	1.7838	0.3421	1.2250	2.5977
35	1.4109	0.3710	0.8426	2.3623
36	1.0000	1.0000	0.1409	7.0990
43	0.1397	0.0557	0.0639	0.3053
46	0.4999	0.3535	0.1250	1.9990

56	0.3729	0.1826	0.1429	0.9735
60	$\leq 10^{-4}$	0.0003	$\leq 10^{-4}$	∞
72	6.2829	0.5166	5.3477	7.3815
73	1.8237	0.3440	1.2601	2.6395
74	1.6242	0.2162	1.2513	2.1083
75	0.7154	0.2947	0.3191	1.6039
76	2.4621	0.4548	1.7142	3.5364
77	3.9588	0.4600	3.1526	4.9712
78	3.8388	0.5004	2.9733	4.9562
79	5.6666	2.5095	2.3788	13.4982
83	3.5674	1.3137	1.7334	7.3417
84	5.9998	4.5825	1.3428	26.8077
87	$\leq 10^{-4}$	0.0046	$\leq 10^{-4}$	$> 10^{4}$
101	1.5001	0.7907	0.5339	4.2151
102	2.0744	0.1880	1.7367	2.4776
103	3.2255	0.3202	2.6552	3.9184
104	4.3138	0.5467	3.3650	5.5301
105	2.3470	0.3558	1.7437	3.1589
106	2.6603	0.5376	1.7903	3.9531
107	2.7920	0.4468	2.0403	3.8206
108	3.3110	0.3875	2.6323	4.1647
109	13.6362	2.9164	8.9669	20.7369
112	1.5000	1.3693	0.2506	8.9770
113	0.2781	0.1425	0.1019	0.7592
117	1.8790	0.5552	1.0530	3.3531
121	1.3900	0.2568	0.9677	1.9967
131	1.4873	0.2195	1.1137	1.9862
135	6.3031	4.2225	1.6957	23.4302
139	0.8382	0.1506	0.5894	1.1921
141	2.1230	0.6841	1.1289	3.9923
143	3.2797	1.0660	1.7345	6.2015
155	1.2914	0.2848	0.8382	1.9897
156	2.4734	0.5127	1.6475	3.7132
158	8.5437	6.9046	1.7529	41.6433
161	2.0466	1.1724	0.6659	6.2901
163	3.5603	0.3325	2.9648	4.2754
164	1.4811	0.2231	1.1025	1.9897
165	0.5536	0.3447	0.1634	1.8760
171	6.5218	1.2372	4.4966	9.4591
172	3.4168	1.2391	1.6786	6.9552
173	2.2859	0.5182	1.4658	3.5648
176	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	$> 10^{4}$
177	$> 10^{4}$	$> 10^{4}$	$\leq 10^{-4}$	$> 10^{4}$
180	$\leq 10^{-4}$	0.0090	$\leq 10^{-4}$	$> 10^{4}$
181	0.1982	0.0718	0.0975	0.4032
191	7.0020	7.4864	0.8613	56.9255

192	8531.3091	$>10^{4}$	$\leq 10^{-4}$	$>10^{4}$
193	5.0708	0.9632	3.4945	7.3581
194	1.3561	0.4620	0.6956	2.6440
196	5.5000	4.2279	1.2191	24.8139
197	9.1588	1.9292	6.0610	13.8399
212	$\leq 10^{-4}$	0.0022	$\leq 10^{-4}$	$>10^{4}$
229	0.3333	0.3849	0.0347	3.2044
242	0.9135	0.8797	0.1384	6.0316
301	1.5709	0.2363	1.1698	2.1095
310	2.9884	2.7498	0.4922	18.1422
312	1.7653	0.6882	0.8222	3.7903
313	3.3425	0.6397	2.2970	4.8638
316	11.0932	8.8249	2.3329	52.7485
317	2.0735	0.8970	0.8881	4.8412
319	9.8997	3.4832	4.9674	19.7293
324	$\leq 10^{-4}$	0.0055	$\leq 10^{-4}$	$>10^{4}$
325	$>10^{4}$	$>10^{4}$	$\leq 10^{-4}$	$>10^{4}$
390	5.9988	6.4789	0.7223	49.8191
401	3.9653	0.6027	2.9437	5.3415
502	2.3699	0.5140	1.5493	3.6252
503	2.0342	0.2454	1.6059	2.5769
506	15.3243	4.2855	8.8581	26.5109
512	1.3137	0.3598	0.7680	2.2470
604	$>10^{4}$	162.2621	$>10^{4}$	$>10^{4}$
795	0.6664	0.4302	0.1880	2.3616

Table 38. Using model $M_{3,3}$, species-specific MLEs of ρ for fall stations, standard errors, and 95% confidence intervals.

SVSPP	$\hat{\rho}$	$SE(\hat{\rho})$	$CI_L(\hat{\rho})$	$CI_U(\hat{\rho})$
1	0.6950	0.2636	0.3304	1.4618
13	1.1217	0.2036	0.7859	1.6010
14	2.3272	0.9230	1.0697	5.0632
15	1.2041	0.0988	1.0252	1.4142
21	1.9998	2.4492	0.1813	22.0537
22	4.8087	0.8990	3.3334	6.9368
23	3.2596	0.3616	2.6226	4.0513
26	9.8461	1.0220	8.0337	12.0675
27	5.8405	1.6760	3.3280	10.2497
28	6.0872	1.9646	3.2337	11.4587
31	1.3166	0.2823	0.8648	2.0044
32	2.0004	0.2356	1.5880	2.5198
33	2.2538	0.4238	1.5590	3.2582

34	1.6540	0.6771	0.7415	3.6896
35	1.6097	0.6110	0.7650	3.3871
36	5.2643	3.6160	1.3698	20.2311
43	0.3130	0.1072	0.1600	0.6125
46	19.3589	24.6500	1.5960	234.8158
56	0.9153	0.2937	0.4880	1.7168
60	5769.0540	$>10^4$	$\leq 10^{-4}$	$>10^4$
72	4.3543	0.2848	3.8303	4.9499
73	2.6801	0.4994	1.8601	3.8615
74	1.8158	0.2433	1.3964	2.3611
75	0.7936	0.2337	0.4457	1.4133
76	2.1533	0.2430	1.7261	2.6863
77	2.6621	0.2493	2.2157	3.1983
78	3.5995	0.4136	2.8737	4.5087
79	2.6645	1.5171	0.8729	8.1335
83	10.8322	4.6433	4.6757	25.0952
84	1.5998	0.9157	0.5210	4.9120
87	1.1666	0.6490	0.3921	3.4713
101	0.6416	0.3091	0.2495	1.6497
102	2.1595	0.1635	1.8617	2.5050
103	2.4054	0.2634	1.9408	2.9813
104	3.3516	0.3081	2.7989	4.0133
105	2.3664	0.2069	1.9937	2.8087
106	2.6440	0.3833	1.9901	3.5128
107	3.2565	0.5127	2.3919	4.4336
108	2.6965	0.3802	2.0453	3.5549
109	4.0346	0.7872	2.7525	5.9138
112	3.5384	1.1118	1.9114	6.5504
117	5.5658	3.4267	1.6652	18.6029
121	1.7046	0.4837	0.9775	2.9726
131	1.9352	0.1717	1.6262	2.3028
135	1.1841	0.1853	0.8712	1.6092
139	1.5000	1.3697	0.2505	8.9814
141	4.9773	1.0940	3.2352	7.6574
143	2.8004	0.3726	2.1575	3.6349
155	1.4189	0.1874	1.0952	1.8381
156	3.3421	1.2684	1.5884	7.0319
158	5.5003	4.2283	1.2191	24.8167
161	4.5732	1.9563	1.9774	10.5767
163	3.1141	0.3044	2.5711	3.7717
164	2.1762	0.3262	1.6222	2.9195
165	2.6998	1.0147	1.2925	5.6396
171	2.8000	0.5634	1.8874	4.1538
172	3.1678	0.8410	1.8826	5.3303
173	2.9981	2.4476	0.6053	14.8507
176	2.5434	1.2293	0.9863	6.5588

177	3.5000	2.8063	0.7271	16.8484
180	0.9996	1.4137	0.0625	15.9819
181	0.4688	0.1485	0.2520	0.8720
191	3.3488	2.5625	0.7474	15.0048
192	2.0008	1.7329	0.3664	10.9255
193	3.6198	0.7206	2.4504	5.3475
194	2.6614	0.6894	1.6018	4.4219
196	3.9339	0.6593	2.8325	5.4638
197	6.3228	1.0693	4.5389	8.8078
212	1.8341	0.5453	1.0241	3.2847
229	0.0269	0.0232	0.0049	0.1462
242	$\leq 10^{-4}$	0.0078	$\leq 10^{-4}$	$> 10^{4}$
301	1.5863	0.1787	1.2720	1.9783
310	5.8334	2.5777	2.4535	13.8692
312	2.7398	0.5568	1.8397	4.0803
313	2.5113	0.4079	1.8266	3.4528
316	6.0918	4.3666	1.4949	24.8251
317	7.1695	3.5321	2.7299	18.8293
319	2.2604	1.3280	0.7146	7.1497
324	2.4946	1.4298	0.8112	7.6711
325	2.5001	2.0917	0.4850	12.8861
390	1.5554	0.6645	0.6732	3.5935
401	3.1657	0.3580	2.5364	3.9512
502	1.4481	0.1569	1.1710	1.7908
503	1.6636	0.1242	1.4372	1.9257
506	34.4235	36.8451	4.2245	280.5019
512	1.9724	0.4687	1.2381	3.1423
604	$\leq 10^{-4}$	0.0009	$\leq 10^{-4}$	247.0034
795	6.8297	3.5406	2.4725	18.8657

Table 39. Tests of relationships of *Henry B. Bigelow* gear covariates with calibration factor assuming beta-binomial models.

	Tow Distance	Net Opening	Door Spread	Wing Spread
Acadian Redfish				
Coefficient	-6.6084	-0.0226	-0.0673	0.0091
St. Error	2.8213	0.0178	0.0659	0.1669
z-value	-2.3423	-1.2724	-1.0210	0.0547
p-value	0.0192	0.2032	0.3073	0.9564
American Plaice				
Coefficient	0.0533	0.0133	-0.0020	-0.1114
St. Error	1.3036	0.0094	0.0221	0.0612
z-value	0.0409	1.4267	-0.0910	-1.8188

p-value	0.9674	0.1537	0.9275	0.0689
Atlantic Cod				
Coefficient	-0.0140	-0.0059	0.0315	0.0782
St. Error	3.3034	0.0185	0.0460	0.0910
z-value	-0.0043	-0.3210	0.6846	0.8592
p-value	0.9966	0.7482	0.4936	0.3902
Atlantic Herring				
Coefficient	6.2133	0.0359	-0.0272	0.0543
St. Error	2.7625	0.0192	0.0287	0.0999
z-value	2.2491	1.8629	-0.9501	0.5431
p-value	0.0245	0.0625	0.3420	0.5871
Atlantic Mackerel				
Coefficient	1.4955	0.0086	0.0132	-0.0250
St. Error	4.7622	0.0292	0.0501	0.2091
z-value	0.3140	0.2965	0.2627	-0.1198
p-value	0.7535	0.7668	0.7928	0.9047
Pollock				
Coefficient	12.1796	0.0242	-0.0482	-0.0607
St. Error	6.0137	0.0351	0.0911	0.2072
z-value	2.0253	0.6899	-0.5294	-0.2931
p-value	0.0428	0.4902	0.5965	0.7694
Red Hake				
Coefficient	0.3072	-0.0158	-0.0520	-0.0287
St. Error	1.9508	0.0138	0.0329	0.1053
z-value	0.1575	-1.1477	-1.5833	-0.2726
p-value	0.8749	0.2511	0.1134	0.7851
Summer Flounder				
Coefficient	2.9659	0.0453	0.0164	-0.2111
St. Error	2.3606	0.0182	0.0371	0.1419
z-value	1.2564	2.4854	0.4432	-1.4872
p-value	0.2090	0.0129	0.6576	0.1370
White Hake				
Coefficient	-2.9794	-0.0036	-0.1134	0.0689
St. Error	2.6702	0.0163	0.0597	0.1631
z-value	-1.1158	-0.2231	-1.9004	0.4223
p-value	0.2645	0.8235	0.0574	0.6728
Windowpane				
Coefficient	-2.5849	-0.0059	0.0062	-0.0961

St. Error	2.3045	0.0172	0.0340	0.0951
z-value	-1.1217	-0.3451	0.1836	-1.0102
p-value	0.2620	0.7300	0.8543	0.3124
Winter Skate				
Coefficient	-4.0194	-0.0139	0.0446	-0.1102
St. Error	2.3553	0.0160	0.0327	0.1027
z-value	-1.7065	-0.8709	1.3662	-1.0726
p-value	0.0879	0.3838	0.1719	0.2834
Yellowtail Flounder				
Coefficient	0.3625	-0.0450	-0.0146	0.1554
St. Error	2.2580	0.0117	0.0389	0.0835
z-value	0.1605	-3.8559	-0.3758	1.8606
p-value	0.8725	0.0001	0.7071	0.0628

Table 40. Species code, vessel-specific mean catches $\left(\overline{W}_v\right)$ and mean fish weights $\left(\overline{w}_v\right)$ over all survey and site-specific stations.

SVSPP	$\overline{W}_A$	$\overline{W}_B$	$\overline{w}_A$	$\overline{w}_B$
1	0.0046	0.0098	0.0605	0.0770
2	0.0000	$0 < x < 10^{-4}$		0.0150
3	0.0000	0.0283		2.9950
4	0.6392	1.2095	5.5685	7.8496
7	$0 < x < 10^{-4}$	0.0000	0.0060	
9	0.1860	0.0849	29.5750	6.7525
12	0.2163	0.0000	45.8467	
13	2.5640	2.5477	2.8164	2.6262
14	0.0210	0.0833	0.2052	0.1206
15	82.0444	105.3431	1.6266	1.5665
16	0.2218	0.6032	5.0383	5.8123
18	1.1041	0.8583	8.3593	4.7059
19	0.7168	0.5594	5.1223	2.9402
21	0.0648	0.0666	6.8667	10.5880
22	1.2199	3.4048	2.4867	2.0506
23	8.8696	27.4859	2.2279	2.0191
24	0.3617	2.1375	1.3069	1.2149
25	0.0087	0.0601	0.1179	0.2012
26	4.4920	19.9635	0.4802	0.4533
27	0.1636	0.5571	0.3971	0.4031
28	0.2729	1.0046	0.8425	0.8057
29	0.0827	0.0131	5.2580	2.0900
30	$0 < x < 10^{-4}$	0.0000	0.0012	

31	1.7656	1.3522	0.0165	0.0188
32	1.3049	7.6232	0.0891	0.1085
33	0.3289	0.5054	0.0902	0.0750
34	0.0435	0.2560	0.0394	0.0647
35	0.0712	0.0556	0.3101	0.1329
36	0.0062	0.0352	0.2829	0.2800
43	0.3969	0.0303	0.0010	0.0016
44	0.0950	0.1530	0.0066	0.0091
46	0.0015	0.0030	0.0100	0.0179
56	0.0105	0.0071	0.0019	0.0029
60	0.0003	0.0002	0.0141	0.0585
63	$0 < x < 10^{-4}$	0.0000	0.0590	
65	0.0002	0.0000	0.0258	
66	0.0003	0.0000	0.0525	
67	0.0000	$0 < x < 10^{-4}$		0.0060
69	0.0067	0.0215	0.1845	0.2043
72	2.3373	11.7000	0.0716	0.0608
73	2.0224	3.8245	1.8323	1.4574
74	26.3929	35.7918	1.1151	1.0713
75	0.8446	1.4715	2.1147	0.3972
76	1.2384	2.4038	0.5792	0.5410
77	1.0219	3.5728	0.1328	0.1327
78	0.3967	1.0222	0.0423	0.0383
79	0.0018	0.0125	0.0643	0.0371
83	0.0023	0.0161	0.0491	0.0525
84	0.0186	0.0516	1.3128	0.9108
87	0.0003	$0 < x < 10^{-4}$	0.0024	0.0018
90	0.0002	0.0031	0.0144	0.0294
91	0.0002	0.0017	0.0545	0.0296
99	0.0014	0.0025	0.2963	0.1778
101	0.0772	0.1112	1.8189	2.3580
102	0.7723	1.3060	0.1844	0.1481
103	0.9754	2.0314	0.8338	0.8218
104	0.8698	2.2902	0.1740	0.1643
105	1.8534	3.9790	0.3652	0.3605
106	1.1304	2.1964	0.6093	0.5104
107	0.1384	0.4219	0.2286	0.2286
108	0.2347	0.4723	0.2009	0.1819
109	0.0343	0.5651	0.0116	0.0173
111	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0095	0.0067
112	0.0073	0.0211	0.2579	0.2127
113	0.0005	0.0003	0.0036	0.0064
114	0.0003	0.0007	0.0104	0.0159
115	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0013	0.0020
116	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0010	0.0030
117	0.0006	0.0069	0.0017	0.0079

118	0.0000	0.0002		0.0725
120	0.0000	0.0004		0.1350
121	0.9814	1.8438	0.1063	0.0777
124	0.0642	0.0011	0.1097	0.0871
126	0.0020	0.0270	0.0268	0.2722
127	0.0002	$0 < x < 10^{-4}$	0.0260	0.0600
129	0.0258	0.0131	0.0410	0.0433
131	2.1148	4.3396	0.0175	0.0236
132	0.0252	0.0183	0.1180	0.1212
133	0.0000	0.0007		0.0868
134	0.0015	0.0000	0.9270	
135	0.5918	0.4385	0.3501	0.2008
136	4.3283	4.2651	0.1226	0.1216
137	0.0001	$0 < x < 10^{-4}$	0.0365	0.0033
139	0.6724	0.4913	3.8878	4.3401
141	0.1046	0.2548	0.1272	0.1052
142	0.0027	0.0124	0.0311	0.0432
143	2.2873	3.0803	0.0388	0.0306
145	0.4972	1.4937	0.0842	0.1065
146	0.0048	0.0335	0.2019	0.1900
148	0.0002	0.0009	0.0523	0.0373
149	1.8537	4.1853	0.0692	0.0690
151	0.0010	0.0069	0.3330	0.4400
154	$0 < x < 10^{-4}$	0.0009	0.0030	0.1463
155	10.4352	11.3076	0.3073	0.2513
156	0.1081	0.2110	0.1252	0.0887
158	0.0004	0.0036	0.0435	0.0322
159	$0 < x < 10^{-4}$	0.0003	0.0031	0.0031
160	$0 < x < 10^{-4}$	0.0001	0.0020	0.0050
161	0.0016	0.0087	0.0086	0.0075
163	0.7454	2.2352	0.1677	0.1458
164	0.5221	0.7307	0.7006	0.5263
165	0.0001	0.0012	0.0013	0.0023
166	0.0000	$0 < x < 10^{-4}$		0.0066
168	0.0419	0.0555	1.4806	0.8818
170	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0004	0.0050
171	0.2608	0.7822	0.0744	0.0539
172	0.0870	0.1731	0.2502	0.1445
173	0.0083	0.0194	0.1356	0.1232
174	$0 < x < 10^{-4}$	0.0166	0.0012	0.0185
175	0.0000	$0 < x < 10^{-4}$		0.0030
176	0.0195	0.0396	0.4956	0.3599
177	0.0264	0.0111	2.4029	0.8862
179	0.0122	0.0198	0.7775	1.2615
180	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0063	0.0030

181	0.0529	0.0554	0.0058	0.0023
183	0.0002	0.0000	0.0013	
184	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0150	0.0265
186	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0160	0.0110
187	$0 < x < 10^{-4}$	0.0004	0.0390	0.0311
188	0.0004	0.0033	0.0391	0.0284
190	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0030	0.0040
191	0.0059	0.0051	0.5319	0.1163
192	0.0105	0.0458	0.6693	1.2140
193	0.2399	0.8347	0.2794	0.2390
194	0.0163	0.0563	0.0259	0.0344
195	0.0000	$0 < x < 10^{-4}$		0.0020
196	0.0030	0.0117	0.0391	0.0392
197	0.4121	2.9995	1.6587	1.8758
198	0.0024	0.0026	0.2164	0.1529
199	0.0000	$0 < x < 10^{-4}$		0.0036
201	0.0015	0.0029	0.0246	0.0293
202	0.0017	0.0074	0.2772	0.2488
203	0.0029	0.0000	0.4600	
204	0.0014	0.0105	0.1778	0.2028
205	0.0001	0.0093	0.0640	0.0514
206	0.0000	0.0001		0.0350
208	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0017	0.0043
209	0.0140	0.0072	0.0322	0.0391
211	0.0320	0.0488	0.0227	0.0282
212	0.0155	0.0246	0.0200	0.0245
213	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0480	0.0080
221	0.0002	0.0021	0.0032	0.0319
228	0.0000	$0 < x < 10^{-4}$		0.0090
229	0.0013	0.0004	0.0009	0.0018
232	0.0005	0.0009	0.0041	0.0051
239	0.0000	$0 < x < 10^{-4}$		0.0150
240	$0 < x < 10^{-4}$	0.0000	0.0058	
242	0.0002	0.0004	0.0032	0.0054
246	0.0000	0.0001		0.0118
249	0.0000	$0 < x < 10^{-4}$		0.0150
252	$0 < x < 10^{-4}$	0.0001	0.0030	0.0037
262	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0025	0.0040
263	$0 < x < 10^{-4}$	0.0021	0.0078	0.0186
270	0.0660	0.3792	5.2450	4.9212
301	1.3081	1.7425	1.2586	1.1027
302	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0010	0.0021
307	0.0074	0.0184	0.0152	0.0060
310	0.0039	0.0214	0.2754	0.2474

311	$0 < x < 10^{-4}$	0.0019	0.0010	0.0119
312	0.0163	0.0749	0.1152	0.1557
313	0.0129	0.0606	0.0214	0.0216
314	0.0004	0.0028	0.1175	0.1262
316	0.0039	0.0106	0.2230	0.0079
317	0.0015	0.0038	0.0316	0.0182
318	0.0665	0.4986	1.0843	1.6264
319	0.0002	0.0055	0.0016	0.0031
320	0.0019	0.0167	0.0065	0.0059
321	0.0010	0.0101	0.0415	0.0349
322	0.0037	0.0341	0.0020	0.0051
323	$0 < x < 10^{-4}$	0.0004	0.0120	0.0163
324	0.0024	0.0069	0.1402	0.1901
325	0.0005	0.0066	0.1080	0.1622
327	$0 < x < 10^{-4}$	0.0000	0.0040	
339	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0090	0.0500
360	0.3066	0.1359	2.4374	2.6191
364	0.0000	0.0057		3.6400
375	1.5375	1.0493	13.2143	11.3108
376	0.1130	0.4316	3.2663	3.2295
378	0.0000	0.0722		22.9600
380	0.1417	0.0126	18.0240	7.9900
384	0.0000	0.0008		0.1325
388	0.0000	0.0007		0.1058
390	0.0021	0.0106	0.1099	0.1877
396	0.0000	0.0008		0.1232
401	1.5619	3.5634	0.0635	0.0465
421	$0 < x < 10^{-4}$	0.0002	0.0013	0.0028
425	0.0001	$0 < x < 10^{-4}$	0.0260	0.0110
428	0.0278	0.1543	0.0453	0.0507
429	0.0042	0.0044	0.0130	0.0172
435	0.0073	0.0451	0.0416	0.0731
437	$0 < x < 10^{-4}$	0.0000	0.0122	
438	$0 < x < 10^{-4}$	0.0000	0.0040	
439	0.0060	0.0278	0.0579	0.0545
444	0.0001	0.0006	0.0370	0.0397
446	0.0000	$0 < x < 10^{-4}$		0.0010
449	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0032	0.0062
451	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0005	0.0050
452	0.0000	0.0001		0.0084
457	0.0000	0.0012		0.0577
458	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0070	0.0060
459	0.0003	$0 < x < 10^{-4}$	0.0508	0.0200
461	$0 < x < 10^{-4}$	0.0014	0.0036	0.0259

462	$0 < x < 10^{-4}$	0.0000	0.0020	
465	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0160	0.0315
471	0.0000	0.0012		0.0569
489	0.0047	0.0047	0.2996	0.1096
490	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0170	0.0070
492	$0 < x < 10^{-4}$	0.0000	0.0010	
501	0.0002	0.0005	0.0027	0.0273
502	0.4253	0.5843	0.0532	0.0544
503	3.6981	5.5323	0.0131	0.0177
504	0.0003	0.0002	0.0050	0.0058
506	0.0005	0.0101	0.0064	0.0064
508	0.0000	$0 < x < 10^{-4}$		0.0070
509	0.0000	0.0007		0.0038
510	0.0000	0.0014		0.1433
511	0.0000	$0 < x < 10^{-4}$		0.0310
512	0.0071	0.0118	0.0244	0.0234
516	0.0001	$0 < x < 10^{-4}$	0.0070	0.0400
517	$0 < x < 10^{-4}$	0.0004	0.0010	0.0492
526	0.0000	0.0002		0.0208
527	0.0000	0.0007		0.0362
530	0.0004	0.0010	0.2450	0.0901
538	0.0000	0.0002		0.1300
541	0.0000	0.0002		0.0565
546	0.0000	0.0005		0.1090
551	0.0000	$0 < x < 10^{-4}$		0.0050
552	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0010	0.0105
556	$0 < x < 10^{-4}$	0.0000	0.0010	
557	$0 < x < 10^{-4}$	0.0000	0.0020	
563	0.0538	0.0450	11.4067	14.3050
564	0.0000	0.0005		0.3000
567	0.0006	0.0002	0.1377	0.0625
568	0.0003	0.0003	0.1040	0.2000
570	0.0006	0.0009	0.1223	0.1400
573	0.0104	0.0024	0.0549	0.0517
579	0.0002	0.0000	0.1000	
596	0.0002	$0 < x < 10^{-4}$	0.0337	0.0300
599	$0 < x < 10^{-4}$	0.0000	0.0089	
604	0.0001	0.0003	0.0213	0.0273
616	$0 < x < 10^{-4}$	0.0001	0.0015	0.0415
617	0.0000	$0 < x < 10^{-4}$		0.0010
621	0.0000	0.0113		2.3933
625	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0140	0.0010
627	0.0005	0.0000	0.0222	
631	0.0111	0.0132	3.5300	2.8067

640	0.0154	0.0134	0.0511	0.0080
646	0.0013	0.0000	0.1042	
648	0.0000	$0 < x < 10^{-4}$		0.0080
651	0.0460	0.1153	0.0883	0.0760
652	0.1702	0.3117	0.1244	0.1215
654	0.0157	0.0000	9.9800	
657	$0 < x < 10^{-4}$	0.0004	0.0185	0.0164
659	0.0113	0.0014	0.2002	0.1492
694	0.0014	0.0027	0.0610	0.0531
700	0.0023	0.0000	1.4600	
726	0.0002	0.0005	0.0392	0.0590
735	0.0003	0.0030	0.0510	0.0655
739	$0 < x < 10^{-4}$	0.0000	0.0010	
744	0.0102	0.0000	2.1533	
745	0.0480	0.0563	0.2441	0.2754
749	0.0000	0.0008		0.1600
754	$0 < x < 10^{-4}$	0.0001	0.0180	0.0160
759	0.0010	0.0013	0.0303	0.0153
760	0.0000	$0 < x < 10^{-4}$		0.0025
761	0.0000	$0 < x < 10^{-4}$		0.0150
762	$0 < x < 10^{-4}$	0.0000	0.0057	
763	0.0000	$0 < x < 10^{-4}$		0.0050
764	$0 < x < 10^{-4}$	0.0004	0.0060	0.0250
766	$0 < x < 10^{-4}$	0.0000	0.0030	
768	$0 < x < 10^{-4}$	0.0006	0.0035	0.0315
769	0.0002	0.0000	0.0398	
773	$0 < x < 10^{-4}$	0.0002	0.0010	0.0040
780	$0 < x < 10^{-4}$	0.0000	0.0027	
786	$0 < x < 10^{-4}$	0.0000	0.0070	
789	0.0000	0.0002		0.1340
793	0.0020	0.0171	0.0904	0.0929
794	$0 < x < 10^{-4}$	0.0000	0.0009	
795	0.0001	0.0052	0.0011	0.0103
820	0.0002	0.0022	0.0310	0.0350
830	0.0000	0.0006		0.0365
832	0.0002	0.0000	0.0495	
833	0.0003	0.0000	0.0415	
843	0.0003	0.0000	0.0620	
849	0.0000	$0 < x < 10^{-4}$		0.0120
852	0.0007	0.0008	0.0023	0.0071
856	$0 < x < 10^{-4}$	0.0001	0.0040	0.0140
857	0.0000	0.0034		0.7233
858	0.0000	0.0041		0.1305
860	0.0000	0.0028		1.8000

861	0.0000	0.0002		0.0513
862	0.0000	$0 < x < 10^{-4}$		0.0170
865	0.0110	0.0029	0.0012	0.0080
866	$0 < x < 10^{-4}$	0.0001	0.0053	0.0108
869	$0 < x < 10^{-4}$	0.0000	0.0030	
873	0.0000	0.0002		0.0550
876	0.0000	0.0001		0.0198
878	0.0000	$0 < x < 10^{-4}$		0.0075
880	0.0000	$0 < x < 10^{-4}$		0.0100
896	0.0004	0.0002	0.0118	0.0128
910	0.0006	0.0004	0.0063	0.0095
950	0.1887	0.4736	60.0000	60.2400

Table 41. Species code, vessel-specific mean catches $\left(\overline{W}_v\right)$ and mean fish weights $\left(\overline{w}_v\right)$ over all spring survey stations. Species not caught and weighed by either vessel are omitted.

SVSPP	$\overline{W}_A$	$\overline{W}_B$	$\overline{w}_A$	$\overline{w}_B$
1	0.0009	0.0092	0.0324	0.0530
2	0.0000	$0 < x < 10^{-4}$		0.0150
3	0.0000	0.0946		2.9950
4	0.9306	1.0322	4.6532	4.4573
9	0.0000	0.2306		6.2600
12	0.7239	0.0000	45.8467	
13	2.7053	3.2185	2.7053	2.7422
14	0.0232	0.1176	0.2444	0.2569
15	111.3772	158.1095	1.7511	1.6982
16	0.3667	0.6903	3.8711	3.1988
18	0.3339	0.1194	9.0629	11.3400
19	0.0038	0.0019	0.7200	0.3600
21	0.0343	0.1862	6.5200	17.6850
22	1.7924	2.2944	2.4858	1.4062
23	7.1234	31.7072	1.6668	1.6216
24	0.3179	2.5099	1.5487	1.4321
25	0.0141	0.0834	0.1118	0.2141
26	9.1400	25.4598	0.4785	0.4328
27	0.3044	0.5439	0.3592	0.4763
28	0.1859	0.7348	1.2180	1.1635
29	0.1033	0.0440	4.9050	2.0900
30	$0 < x < 10^{-4}$	0.0000	0.0010	
31	0.0095	0.0017	0.0283	0.0250
32	0.9136	8.9585	0.0400	0.0944

33	0.4419	0.8686	0.0598	0.0543
34	0.0819	0.3421	0.0478	0.0423
35	0.0748	0.0534	0.2734	0.1470
36	0.0096	0.0018	0.3033	0.1700
43	0.0726	0.0235	0.0015	0.0021
44	0.0148	0.0000	0.0152	
46	0.0047	0.0001	0.0098	0.0067
56	0.0043	0.0008	0.0015	0.0021
60	0.0009	0.0000	0.0140	
63	0.0003	0.0000	0.0590	
69	0.0047	0.0206	0.1500	0.1777
72	1.2831	7.8710	0.0571	0.0419
73	1.9642	4.0931	1.9337	1.8472
74	14.1351	12.4165	0.8782	0.7941
75	1.2083	1.2824	2.5229	2.4124
76	1.0440	2.2806	0.5449	0.5221
77	0.6433	2.6447	0.1179	0.1105
78	0.2750	0.8442	0.0170	0.0154
79	0.0020	0.0061	0.0627	0.0341
83	0.0022	0.0115	0.0325	0.0445
84	0.0247	0.0313	2.3500	0.4958
87	$0 < x < 10^{-4}$	0.0000	0.0006	
90	0.0004	0.0058	0.0192	0.0275
99	0.0001	0.0083	0.0210	0.2617
101	0.0555	0.1644	1.7567	3.4700
102	0.2532	0.5347	0.1956	0.1973
103	0.6332	1.9411	0.9045	0.8597
104	0.7662	2.3373	0.1482	0.1459
105	1.2770	2.5520	0.3456	0.3305
106	1.6436	1.4531	0.7130	0.3927
107	0.1966	0.4306	0.2063	0.1826
108	0.1793	0.5151	0.2129	0.1973
109	0.0136	0.2075	0.0128	0.0139
111	0.0000	$0 < x < 10^{-4}$		0.0075
112	0.0033	0.0025	0.3100	0.1583
113	0.0016	0.0011	0.0037	0.0064
114	0.0005	0.0023	0.0206	0.0159
116	0.0000	$0 < x < 10^{-4}$		0.0030
117	0.0013	0.0106	0.0013	0.0063
118	0.0000	0.0008		0.0725
120	0.0000	0.0010		0.1900
121	2.3939	5.6868	0.1000	0.0758
126	0.0024	0.0029	0.0106	0.0195
127	0.0000	0.0003		0.0600
131	1.7376	4.3799	0.0235	0.0372
135	0.0362	0.1883	2.2933	1.8832

136	1.9832	0.6243	0.1088	0.0995
139	1.3725	1.2561	3.8350	4.1868
141	0.0597	0.3277	0.1956	0.3082
142	0.0003	0.0010	0.0510	0.0462
143	0.7071	0.4957	0.1410	0.0721
145	0.1790	3.2618	0.0883	0.1283
146	0.0064	0.0060	0.2042	0.1892
148	0.0008	0.0025	0.0523	0.0600
149	0.0431	1.9744	0.0438	0.0704
154	$0 < x < 10^{-4}$	0.0031	0.0030	0.1463
155	7.6420	10.5762	0.3645	0.3274
156	0.2989	0.4181	0.1475	0.0915
158	0.0005	0.0098	0.0215	0.0395
160	$0 < x < 10^{-4}$	0.0004	0.0020	0.0050
161	0.0011	0.0062	0.0062	0.0067
163	0.7497	2.0888	0.1727	0.1448
164	0.7342	0.8013	0.9300	0.6952
165	0.0001	0.0002	0.0010	0.0032
168	0.0000	0.0168		0.6390
170	0.0000	0.0001		0.0050
171	0.3345	0.7423	0.0944	0.0728
172	0.0728	0.2097	0.2712	0.0953
173	0.0199	0.0460	0.1350	0.1367
174	0.0001	0.0003	0.0013	0.0026
176	0.0000	0.0022		0.0820
177	0.0000	0.0054		1.0200
179	0.0000	0.0259		1.6383
180	$0 < x < 10^{-4}$	0.0000	0.0040	
181	0.0606	0.0046	0.0096	0.0140
184	$0 < x < 10^{-4}$	0.0000	0.0060	
188	$0 < x < 10^{-4}$	0.0002	0.0040	0.0350
190	$0 < x < 10^{-4}$	0.0000	0.0030	
191	0.0005	0.0072	0.1000	0.0806
192	0.0000	0.0122		0.7733
193	0.2567	0.9661	0.5480	0.2752
194	0.0183	0.0349	0.0272	0.0345
196	0.0004	0.0016	0.0400	0.0282
197	0.1917	2.7266	1.4572	2.2622
199	0.0000	0.0001		0.0036
201	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0060	0.0150
202	0.0015	0.0000	0.1465	
206	0.0000	0.0004		0.0350
208	0.0000	$0 < x < 10^{-4}$		0.0050
211	$0 < x < 10^{-4}$	0.0000	0.0030	
212	0.0001	0.0000	0.0022	

221	0.0002	0.0018	0.0022	0.0345
229	0.0012	0.0010	0.0010	0.0020
232	0.0014	0.0017	0.0052	0.0039
239	0.0000	0.0002		0.0150
242	$0 < x < 10^{-4}$	0.0013	0.0053	0.0053
262	$0 < x < 10^{-4}$	0.0000	0.0010	
263	$0 < x < 10^{-4}$	0.0006	0.0050	0.0220
301	1.3818	1.3164	1.4040	1.1369
307	0.0110	0.0072	0.0178	0.0059
310	0.0059	0.0256	0.3763	0.2859
311	0.0000	0.0065		0.0121
312	0.0080	0.0404	0.1271	0.1671
313	0.0119	0.0605	0.0137	0.0159
316	$0 < x < 10^{-4}$	0.0023	0.0027	0.0030
317	0.0029	0.0049	0.0392	0.0319
318	0.1396	0.9037	0.8840	1.5469
319	0.0004	0.0097	0.0016	0.0022
320	$0 < x < 10^{-4}$	0.0143	0.0015	0.0061
321	0.0008	0.0010	0.0360	0.0273
322	0.0003	0.0005	0.0135	0.0086
323	0.0000	0.0005		0.0200
324	0.0017	0.0000	0.3240	
325	0.0000	0.0070		0.1663
327	$0 < x < 10^{-4}$	0.0000	0.0040	
339	$0 < x < 10^{-4}$	0.0003	0.0090	0.0500
360	0.0559	0.0000	2.1240	
375	2.4036	0.0271	26.8635	1.7133
376	0.0034	0.0010	0.6400	0.1950
378	0.0000	0.2417		22.9600
380	0.3375	0.0421	16.0300	7.9900
384	0.0000	0.0028		0.1325
388	0.0000	0.0007		0.1250
390	0.0006	0.0044	0.0400	0.1050
401	1.3737	2.9768	0.0738	0.0344
421	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0010	0.0034
425	0.0003	$0 < x < 10^{-4}$	0.0280	0.0150
435	0.0099	0.0367	0.0483	0.0812
437	0.0002	0.0000	0.0095	
438	$0 < x < 10^{-4}$	0.0000	0.0040	
439	0.0008	0.0117	0.0513	0.0718
446	0.0000	$0 < x < 10^{-4}$		0.0010
449	$0 < x < 10^{-4}$	0.0003	0.0055	0.0062
451	0.0000	0.0002		0.0050
457	0.0000	0.0003		0.0500
459	0.0000	0.0001		0.0200

461	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0010	0.0150
489	0.0122	0.0082	0.4640	0.3875
490	0.0000	$0 < x < 10^{-4}$		0.0050
501	0.0003	0.0000	0.0032	
502	0.0253	0.0604	0.0254	0.0283
503	1.8441	3.8634	0.0101	0.0143
504	0.0009	0.0005	0.0050	0.0059
506	0.0014	0.0306	0.0061	0.0063
509	0.0000	0.0015		0.0038
510	0.0000	0.0003		0.0120
512	0.0085	0.0115	0.0238	0.0240
516	0.0004	0.0002	0.0070	0.0400
517	$0 < x < 10^{-4}$	0.0000	0.0010	
527	0.0000	0.0025		0.0362
530	0.0013	0.0012	0.2450	0.1125
551	0.0000	$0 < x < 10^{-4}$		0.0050
564	0.0000	0.0016		0.3000
596	0.0000	0.0002		0.0300
604	0.0000	0.0003		0.0500
621	0.0000	0.0378		2.3933
631	0.0372	0.0434	3.5300	4.1250
640	0.0042	0.0203	0.0296	0.0039
651	0.0520	0.0008	0.0668	0.0290
652	0.0130	0.0373	0.1769	0.0730
659	0.0002	0.0007	0.0430	0.1250
726	0.0000	0.0010		0.0950
735	0.0008	0.0012	0.0510	0.0440
739	$0 < x < 10^{-4}$	0.0000	0.0010	
754	0.0000	0.0004		0.0160
759	$0 < x < 10^{-4}$	0.0029	0.0015	0.0139
760	0.0000	$0 < x < 10^{-4}$		0.0025
761	0.0000	0.0003		0.0150
763	0.0000	$0 < x < 10^{-4}$		0.0050
764	0.0000	0.0014		0.0250
768	0.0002	0.0019	0.0035	0.0308
769	$0 < x < 10^{-4}$	0.0000	0.0075	
773	0.0000	0.0006		0.0058
780	$0 < x < 10^{-4}$	0.0000	0.0027	
793	0.0005	0.0339	0.0910	0.1111
795	$0 < x < 10^{-4}$	0.0029	0.0011	0.0109
843	0.0003	0.0000	0.0600	
852	$0 < x < 10^{-4}$	0.0009	0.0050	0.0129
856	0.0000	0.0004		0.0140
857	0.0000	0.0061		1.1500
866	0.0000	0.0003		0.0110

880	0.0000	$0 < x < 10^{-4}$		0.0100
896	$0 < x < 10^{-4}$	0.0000	0.0100	
910	0.0020	0.0013	0.0063	0.0092
950	0.6316	1.1579	60.0000	55.0000

Table 42. Species code, vessel-specific mean catches $\left(\overline{W}_v\right)$ and mean fish weights $\left(\overline{w}_v\right)$ over all fall survey stations. Species not caught and weighed by either vessel are omitted.

SVSPP	$\overline{W}_A$	$\overline{W}_B$	$\overline{w}_A$	$\overline{w}_B$
1	0.0060	0.0053	0.0601	0.0891
4	0.9151	2.2834	6.5623	10.6137
7	$0 < x < 10^{-4}$	0.0000	0.0060	
9	0.4713	0.0406	29.5750	10.2000
13	3.4020	3.0877	2.8463	2.4920
14	0.0232	0.0569	0.1877	0.0554
15	30.4859	44.2472	1.1338	1.1392
16	0.2844	1.0058	7.1392	10.0984
18	2.5448	2.0845	8.2953	4.5896
19	1.8134	1.4159	5.1724	2.9617
21	0.0029	0.0278	0.7200	3.4910
22	1.0375	3.8492	2.2069	2.0383
23	10.2822	22.2387	2.9665	2.4590
24	0.6690	3.5162	1.2347	1.1229
25	0.0114	0.0892	0.1243	0.1929
26	1.5556	13.8563	0.4949	0.4430
27	0.0412	0.2999	0.3693	0.4135
28	0.1106	0.5468	1.5420	1.1342
29	0.1313	0.0000	5.4933	
31	4.4661	3.4247	0.0164	0.0188
32	1.2795	2.8548	0.1385	0.1351
33	0.2134	0.3639	0.1484	0.1292
34	0.0058	0.0120	0.0762	0.0796
35	0.0914	0.0620	0.4412	0.1525
36	0.0062	0.0879	0.2600	0.2829
43	0.9090	0.0590	0.0010	0.0015
44	0.2296	0.3876	0.0064	0.0091
46	0.0001	0.0057	0.0280	0.0625
56	0.0229	0.0173	0.0020	0.0030
60	0.0000	0.0004		0.1070
65	0.0004	0.0000	0.0258	
66	0.0008	0.0000	0.0525	
67	0.0000	$0 < x < 10^{-4}$		0.0060
69	0.0133	0.0390	0.1967	0.2173

72	2.2965	12.7646	0.0817	0.0816
73	0.8068	2.1512	1.9853	1.3601
74	10.1132	14.6056	1.0885	0.8924
75	0.8502	0.4128	3.0056	1.3283
76	1.5635	2.5055	0.7240	0.5944
77	0.7625	2.9176	0.1257	0.1416
78	0.6706	1.6126	0.0696	0.0721
79	0.0029	0.0245	0.0668	0.0364
83	0.0014	0.0142	0.0578	0.0548
84	0.0195	0.0274	0.9790	0.8600
87	0.0007	0.0002	0.0029	0.0018
90	0.0002	0.0035	0.0106	0.0321
91	0.0004	0.0043	0.0545	0.0296
99	0.0035	0.0001	0.4340	0.0100
101	0.1471	0.0997	2.3081	2.2755
102	0.7295	1.2478	0.1543	0.1209
103	0.9870	2.1082	0.7992	0.7112
104	0.8270	1.7786	0.1870	0.1707
105	2.2040	5.3736	0.3756	0.3812
106	0.9503	2.4633	0.5384	0.5258
107	0.1256	0.4320	0.2220	0.2236
108	0.3076	0.5848	0.1716	0.1595
109	0.0180	0.2368	0.0072	0.0156
111	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0095	0.0050
112	0.0148	0.0400	0.2850	0.2184
114	0.0003	0.0000	0.0065	
115	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0013	0.0020
117	0.0002	0.0071	0.0068	0.0090
120	0.0000	0.0003		0.0800
121	0.2044	0.1074	0.1951	0.1785
124	0.1626	0.0028	0.1097	0.0871
126	0.0033	0.0661	0.1660	0.4743
127	0.0004	0.0000	0.0260	
129	0.0654	0.0332	0.0410	0.0433
131	2.6094	5.2008	0.0175	0.0163
132	0.0639	0.0463	0.1180	0.1237
133	0.0000	0.0017		0.0868
134	0.0037	0.0000	0.9270	
135	1.3341	0.8003	0.3195	0.1480
136	9.4662	10.3346	0.1251	0.1229
137	0.0003	$0 < x < 10^{-4}$	0.0365	0.0033
139	0.0456	0.0414	3.8133	3.4667
141	0.1593	0.2697	0.1028	0.0630
142	0.0067	0.0306	0.0308	0.0432
143	4.3545	6.1633	0.0341	0.0284
145	1.1244	1.3159	0.0837	0.0808

146	0.0072	0.0802	0.2004	0.1900
148	0.0000	0.0003		0.0114
149	4.6644	9.1104	0.0695	0.0688
151	0.0017	0.0030	0.4200	0.2533
154	0.0000	0.0000		
155	10.3366	10.8363	0.2763	0.2146
156	0.0392	0.1954	0.0652	0.0794
158	0.0007	0.0006	0.0875	0.0145
159	0.0001	0.0004	0.0031	0.0043
161	0.0019	0.0075	0.0070	0.0059
163	0.6575	1.7893	0.1669	0.1485
164	0.4352	0.7361	0.5489	0.4562
165	0.0001	0.0006	0.0013	0.0028
166	0.0000	0.0002		0.0066
168	0.0919	0.1273	1.5378	0.9987
170	$0 < x < 10^{-4}$	0.0000	0.0004	
171	0.3383	1.1967	0.0674	0.0521
172	0.1597	0.2623	0.2638	0.2172
173	0.0060	0.0137	0.1370	0.0982
174	$0 < x < 10^{-4}$	0.0418	0.0005	0.0191
175	0.0000	$0 < x < 10^{-4}$		0.0030
176	0.0327	0.0460	0.6833	0.4437
177	0.0159	0.0242	1.9900	0.8671
179	0.0310	0.0307	0.7775	1.1000
180	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0060	0.0030
181	0.0036	0.0006	0.0054	0.0028
183	0.0005	0.0000	0.0013	
184	$0 < x < 10^{-4}$	0.0002	0.0240	0.0265
186	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0160	0.0110
187	0.0002	0.0011	0.0390	0.0311
188	0.0011	0.0081	0.0450	0.0283
191	0.0076	0.0067	0.6370	0.1688
192	0.0168	0.0133	0.7033	0.8362
193	0.2296	0.6585	0.1757	0.1968
194	0.0218	0.1021	0.0263	0.0356
195	0.0000	$0 < x < 10^{-4}$		0.0020
196	0.0073	0.0284	0.0408	0.0403
197	0.4542	2.1153	1.4432	1.2347
198	0.0060	0.0067	0.2164	0.1529
201	0.0038	0.0072	0.0251	0.0295
202	0.0033	0.0188	0.4080	0.2488
203	0.0073	0.0000	0.4600	
204	0.0035	0.0267	0.1778	0.2028
205	0.0003	0.0225	0.0640	0.0544
208	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0018	0.0030

209	0.0355	0.0182	0.0322	0.0391
211	0.0809	0.1236	0.0229	0.0282
212	0.0387	0.0623	0.0229	0.0245
213	0.0002	0.0002	0.0480	0.0080
221	0.0005	0.0040	0.0036	0.0311
228	0.0000	$0 < x < 10^{-4}$		0.0090
229	0.0022	$0 < x < 10^{-4}$	0.0009	0.0013
232	0.0003	0.0011	0.0025	0.0078
240	0.0001	0.0000	0.0058	
242	0.0004	0.0000	0.0030	
246	0.0000	0.0003		0.0118
252	$0 < x < 10^{-4}$	0.0003	0.0030	0.0037
262	0.0002	$0 < x < 10^{-4}$	0.0026	0.0040
263	$0 < x < 10^{-4}$	0.0050	0.0120	0.0183
270	0.1672	0.9607	5.2450	4.9212
301	1.7286	2.5105	1.1823	1.0246
302	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0010	0.0021
307	0.0104	0.0412	0.0136	0.0060
310	0.0054	0.0339	0.2250	0.2434
311	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0010	0.0015
312	0.0186	0.0761	0.0991	0.1327
313	0.0184	0.0817	0.0263	0.0259
314	0.0009	0.0070	0.1175	0.1262
316	0.0097	0.0250	0.4874	0.0089
317	0.0010	0.0057	0.0320	0.0144
318	0.0628	0.5794	1.7520	1.7313
319	0.0001	0.0062	0.0016	0.0053
320	0.0048	0.0315	0.0065	0.0058
321	0.0019	0.0248	0.0435	0.0352
322	0.0092	0.0859	0.0020	0.0051
323	$0 < x < 10^{-4}$	0.0007	0.0120	0.0148
324	0.0036	0.0074	0.1508	0.1230
325	0.0013	0.0089	0.1080	0.1491
360	0.7346	0.3443	2.4583	2.6191
364	0.0000	0.0145		3.6400
375	2.0764	2.6382	9.1435	11.8250
376	0.2837	1.0929	3.3914	3.2656
388	0.0000	0.0012		0.0993
390	0.0048	0.0097	0.1332	0.1740
396	0.0000	0.0020		0.1233
401	2.4987	6.0219	0.0572	0.0570
421	$0 < x < 10^{-4}$	0.0005	0.0014	0.0028
425	$0 < x < 10^{-4}$	0.0001	0.0220	0.0097
428	0.0704	0.3911	0.0453	0.0507
429	0.0107	0.0111	0.0130	0.0172

435	0.0108	0.0863	0.0377	0.0708
437	$0 < x < 10^{-4}$	0.0000	0.0230	
439	0.0146	0.0617	0.0583	0.0526
444	0.0003	0.0014	0.0370	0.0397
449	$0 < x < 10^{-4}$	0.0000	0.0010	
451	$0 < x < 10^{-4}$	0.0000	0.0005	
452	0.0000	0.0003		0.0094
457	0.0000	0.0028		0.0583
458	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0070	0.0060
459	0.0008	0.0000	0.0508	
461	$0 < x < 10^{-4}$	0.0034	0.0040	0.0262
462	$0 < x < 10^{-4}$	0.0000	0.0020	
465	0.0001	0.0003	0.0160	0.0315
471	0.0000	0.0029		0.0569
489	0.0027	0.0056	0.1352	0.0612
490	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0170	0.0090
492	$0 < x < 10^{-4}$	0.0000	0.0010	
501	0.0002	0.0012	0.0024	0.0273
502	0.6584	0.9496	0.0969	0.0798
503	5.1090	6.0577	0.0136	0.0191
504	$0 < x < 10^{-4}$	0.0002	0.0050	0.0056
506	$0 < x < 10^{-4}$	0.0012	0.0010	0.0087
508	0.0000	$0 < x < 10^{-4}$		0.0070
509	0.0000	0.0006		0.0040
510	0.0000	0.0032		0.8000
511	0.0000	$0 < x < 10^{-4}$		0.0060
512	0.0105	0.0144	0.0246	0.0242
526	0.0000	0.0004		0.0208
530	0.0000	0.0016		0.0812
538	0.0000	0.0005		0.1300
541	0.0000	0.0005		0.0565
546	0.0000	0.0013		0.1090
552	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0010	0.0105
556	$0 < x < 10^{-4}$	0.0000	0.0010	
557	$0 < x < 10^{-4}$	0.0000	0.0020	
563	0.1363	0.1140	11.4067	14.3050
567	0.0016	0.0005	0.1377	0.0625
568	0.0008	0.0008	0.1040	0.2000
570	0.0015	0.0022	0.1223	0.1400
573	0.0263	0.0060	0.0549	0.0517
579	0.0004	0.0000	0.1000	
596	0.0004	0.0000	0.0337	
599	0.0002	0.0000	0.0089	
604	$0 < x < 10^{-4}$	0.0000	0.0010	

616	0.0000	0.0003		0.0415
617	0.0000	$0 < x < 10^{-4}$		0.0010
625	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0140	0.0010
627	0.0011	0.0000	0.0222	
631	0.0000	0.0007		0.1700
640	0.0359	0.0186	0.0546	0.0562
646	0.0033	0.0000	0.1042	
648	0.0000	$0 < x < 10^{-4}$		0.0080
651	0.0771	0.2916	0.1058	0.0762
652	0.4213	0.7615	0.1235	0.1245
654	0.0398	0.0000	9.9800	
657	0.0001	0.0009	0.0185	0.0164
659	0.0285	0.0031	0.2047	0.1540
694	0.0036	0.0068	0.0610	0.0531
700	0.0058	0.0000	1.4600	
726	0.0006	0.0004	0.0392	0.0350
735	0.0002	0.0000	0.0510	
744	0.0257	0.0000	2.1533	
745	0.1216	0.1426	0.2441	0.2754
749	0.0000	0.0019		0.1600
754	$0 < x < 10^{-4}$	0.0000	0.0180	
759	0.0024	0.0011	0.0375	0.0190
762	0.0003	0.0000	0.0057	
764	$0 < x < 10^{-4}$	0.0000	0.0060	
766	$0 < x < 10^{-4}$	0.0000	0.0030	
768	0.0000	0.0002		0.0400
769	0.0006	0.0000	0.0720	
773	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0010	0.0005
786	$0 < x < 10^{-4}$	0.0000	0.0070	
789	0.0000	0.0005		0.1340
793	0.0047	0.0176	0.0903	0.0751
794	$0 < x < 10^{-4}$	0.0000	0.0009	
795	0.0002	0.0108	0.0013	0.0107
820	0.0005	0.0056	0.0310	0.0358
830	0.0000	0.0015		0.0365
832	0.0004	0.0000	0.0495	
833	0.0007	0.0000	0.0415	
843	0.0005	0.0000	0.0630	
849	0.0000	$0 < x < 10^{-4}$		0.0120
852	0.0017	0.0014	0.0023	0.0058
856	$0 < x < 10^{-4}$	0.0000	0.0040	
857	0.0000	0.0041		0.5100
858	0.0000	0.0104		0.1305
860	0.0000	0.0072		1.8000
861	0.0000	0.0006		0.0513

862	0.0000	$0 < x < 10^{-4}$		0.0170
865	0.0280	0.0072	0.0012	0.0080
866	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0053	0.0100
869	$0 < x < 10^{-4}$	0.0000	0.0030	
873	0.0000	0.0004		0.0550
876	0.0000	0.0003		0.0198
878	0.0000	$0 < x < 10^{-4}$		0.0075
896	0.0009	0.0005	0.0119	0.0128
910	0.0000	0.0001		0.0117
950	0.0000	0.3235		81.2000

Table 43. Species code, vessel-specific mean catches $\left(\overline{W}_v\right)$ and mean fish weights $\left(\overline{w}_v\right)$ over all site-specific stations. Species not caught and weighed by either vessel are omitted.

SVSPP	$\overline{W}_A$	$\overline{W}_B$	$\overline{w}_A$	$\overline{w}_B$
1	0.0064	0.0161	0.0690	0.0954
13	1.3476	1.1991	2.9526	2.8172
14	0.0160	0.0837	0.1950	0.1737
15	119.8289	132.5712	1.7642	1.6863
21	0.1742	0.0000	8.4900	
22	0.8969	3.9146	3.0682	2.8064
23	8.7529	30.1270	2.0080	2.1978
24	0.0087	0.0000	1.7000	
26	3.7429	22.4693	0.4767	0.4877
27	0.1840	0.9009	0.4915	0.3660
28	0.5665	1.8567	0.6948	0.6559
30	$0 < x < 10^{-4}$	0.0000	0.0012	
31	0.0008	0.0002	0.0400	0.0370
32	1.7190	12.4600	0.1259	0.1137
33	0.3673	0.3336	0.1288	0.1205
34	0.0547	0.4861	0.0298	0.1007
35	0.0416	0.0495	0.1932	0.1016
36	0.0030	0.0000	0.2900	
43	0.0536	$0 < x < 10^{-4}$	0.0024	0.0025
46	0.0000	0.0024		0.0057
56	0.0005	$0 < x < 10^{-4}$	0.0016	0.0020
60	0.0002	$0 < x < 10^{-4}$	0.0150	0.0100
72	3.4168	14.0604	0.0706	0.0579
73	3.6439	5.7167	1.7458	1.3099
74	59.2915	85.8382	1.1965	1.1813
75	0.4829	3.0186	1.0236	0.2704

76	1.0096	2.3930	0.4336	0.4975
77	1.7246	5.3207	0.1441	0.1400
78	0.1628	0.4358	0.0670	0.0878
79	0.0002	0.0034	0.0460	0.0554
83	0.0036	0.0231	0.0640	0.0556
84	0.0114	0.1024	1.1100	1.2475
87	$0 < x < 10^{-4}$	0.0001	0.0012	0.0018
101	0.0084	0.0743	0.3280	1.4480
102	1.3331	2.1326	0.2112	0.1661
103	1.2939	2.0204	0.8383	0.9874
104	1.0258	2.9029	0.1840	0.1766
105	1.9637	3.5742	0.3636	0.3459
106	0.8622	2.5772	0.5623	0.5857
107	0.0981	0.4006	0.3086	0.3242
108	0.1949	0.2857	0.2857	0.2371
109	0.0756	1.3360	0.0139	0.0184
112	0.0016	0.0148	0.1060	0.2057
113	$0 < x < 10^{-4}$	0.0000	0.0025	
116	$0 < x < 10^{-4}$	0.0000	0.0010	
117	0.0004	0.0029	0.0101	0.0142
121	0.6053	0.3343	0.1115	0.0949
131	1.8459	3.1918	0.0142	0.0435
132	0.0000	$0 < x < 10^{-4}$		0.0020
135	0.1777	0.2165	1.4442	3.2469
139	0.7971	0.3253	3.9856	5.2867
141	0.0778	0.1647	0.1997	0.1216
143	1.1660	1.6302	0.0503	0.0387
151	0.0013	0.0187	0.2460	0.5200
155	13.2837	12.6268	0.3151	0.2511
156	0.0108	0.0293	0.1615	0.2194
158	0.0000	0.0015		0.0214
159	$0 < x < 10^{-4}$	0.0005	0.0030	0.0024
161	0.0017	0.0126	0.0196	0.0103
163	0.8545	2.9519	0.1645	0.1445
164	0.4274	0.6550	0.6667	0.4932
165	0.0001	0.0030	0.0019	0.0022
168	0.0184	0.0006	1.1943	0.0397
171	0.0892	0.2877	0.0586	0.0369
172	0.0071	0.0227	0.0766	0.1078
173	0.0000	0.0007		0.1400
176	0.0215	0.0679	0.3222	0.3397
177	0.0658	0.0000	2.5680	
180	$0 < x < 10^{-4}$	0.0000	0.0090	
181	0.1090	0.1753	0.0048	0.0022
183	$0 < x < 10^{-4}$	0.0000	0.0010	

190	0.0000	$0 < x < 10^{-4}$		0.0040
191	0.0088	0.0010	0.5707	0.1990
192	0.0127	0.1204	0.6183	1.3806
193	0.2367	0.9335	0.3579	0.2549
194	0.0073	0.0182	0.0218	0.0273
196	$0 < x < 10^{-4}$	$0 < x < 10^{-4}$	0.0005	0.0010
197	0.5725	4.4034	2.0674	2.3985
205	0.0000	0.0013		0.0226
211	$0 < x < 10^{-4}$	0.0000	0.0014	
212	0.0007	0.0000	0.0024	
229	0.0003	0.0004	0.0015	0.0016
242	0.0000	$0 < x < 10^{-4}$		0.0090
249	0.0000	0.0002		0.0150
301	0.6948	1.1691	1.2663	1.3410
310	0.0000	0.0012		0.0760
312	0.0215	0.1069	0.1350	0.1796
313	0.0067	0.0334	0.0306	0.0247
316	0.0000	$0 < x < 10^{-4}$		0.0024
317	0.0007	0.0003	0.0178	0.0137
319	0.0000	0.0003		0.0059
320	0.0000	$0 < x < 10^{-4}$		0.0020
324	0.0016	0.0130	0.0782	0.3159
325	0.0000	0.0033		0.2170
380	0.1333	0.0000	26.0000	
390	0.0000	0.0179		0.2487
401	0.5396	0.9704	0.0918	0.0326
435	0.0003	0.0000	0.0620	
452	0.0000	$0 < x < 10^{-4}$		0.0010
502	0.5149	0.6245	0.0315	0.0354
503	3.6884	6.4819	0.0142	0.0187
506	0.0002	0.0014	0.0105	0.0067
511	0.0000	0.0003		0.0560
512	0.0014	0.0089	0.0269	0.0211
517	0.0000	0.0013		0.0492
604	0.0004	0.0009	0.0280	0.0240
616	$0 < x < 10^{-4}$	0.0000	0.0015	
735	0.0000	0.0086		0.0700
795	$0 < x < 10^{-4}$	0.0002	0.0008	0.0030
820	0.0000	$0 < x < 10^{-4}$		0.0010

Table 44. Likelihood ratio test statistics comparing weight models in Table 4 where the weights are assumed to be gamma random variables, by species (SVSPP code). Tests were not possible where values are missing. Species where all tests were not possible are omitted.

SVSPP	M_1 to M_2	M_2 to M_3
1	16.388	25.658
2	0.012	0.174
3		$< 10^{-3}$
4	$< 10^{-3}$	6.553
7	3.527	$< 10^{-3}$
9	$< 10^{-3}$	27.301
12		$< 10^{-3}$
13	84.522	3.528
14	28.733	91.025
15	331.916	103.216
16		16.994
18		29.857
19	$< 10^{-3}$	53.487
21	9.371	46.846
22	41.575	20.938
23	73.854	86.413
24	24.771	23.413
25	$< 10^{-3}$	3.011
26	41.613	8.399
27	10.505	14.793
28	36.512	3.457
29	$< 10^{-3}$	1.473
30	24.368	0.633
31		839.900
32	426.488	397.384
33	144.616	76.246
34	63.926	30.881
35	15.722	20.106
36	23.892	10.362
43	71.543	71.916
44		30.683
46	23.080	43.490
56	47.496	13.935
60	49.487	
63	0.422	
65	$< 10^{-3}$	$< 10^{-3}$
66	0.924	0.014
67	3.527	$< 10^{-3}$
69	$< 10^{-3}$	62.245
72	12.262	170.961
73	10.534	12.636

74	55.501	35.207
75	111.725	17.051
76	25.047	4.734
77	56.020	78.562
78	133.953	627.414
79	35.143	2.203
83	12.571	5.697
84	7.680	12.524
87	5.374	13.660
90	$< 10^{-3}$	9.658
91	$< 10^{-3}$	$< 10^{-3}$
99		49.304
101	15.247	3.498
102	78.461	92.536
103	44.664	31.533
104	65.211	27.593
105	5.823	64.136
106	13.254	21.346
107	80.063	12.555
108	31.631	32.624
109	38.136	38.440
111		39.194
112	37.313	20.641
113	28.055	
114		28.738
115		1.061
116	1.026	
117	47.825	25.389
118	$< 10^{-3}$	0.328
120	$< 10^{-3}$	42.778
121	44.150	158.787
124		$< 10^{-3}$
126	$< 10^{-3}$	49.792
127	8.241	
129		$< 10^{-3}$
131	276.361	111.293
132	65.272	4.182
133	$< 10^{-3}$	$< 10^{-3}$
134		$< 10^{-3}$
135	118.725	51.201
136		52.511
137		2.206
139	5.223	10.413
141	31.310	79.331
142	$< 10^{-3}$	53.753

143	13.790	102.668
145	$< 10^{-3}$	63.181
146		18.767
148		32.161
149		61.717
151	57.051	10.963
154	35.908	
155	5.563	75.088
156	36.635	19.406
158	3.336	18.936
159	38.785	
160	1.971	
161	34.162	6.908
163	36.006	3.625
164	53.657	88.248
165	17.918	16.714
166	$< 10^{-3}$	$< 10^{-3}$
168	5.978	1.387
170	$< 10^{-3}$	
171	127.770	32.949
172	21.736	35.351
173	28.052	1.741
174	$< 10^{-3}$	66.821
175		$< 10^{-3}$
176	4.335	3.599
177	24.940	27.852
179	$< 10^{-3}$	4.482
180	25.207	45.960
181	174.132	54.337
183	22.466	1.733
184		53.774
186		0.425
187	1.929	
188	$< 10^{-3}$	59.675
190		1.660
191	26.458	41.244
192	5.442	25.861
193	22.261	76.680
194	42.306	3.093
195	0.012	$< 10^{-3}$
196	87.484	8.198
197	63.434	55.682
198	$< 10^{-3}$	$< 10^{-3}$
199		1.973
201		56.565

202	$< 10^{-3}$	27.720
203	$< 10^{-3}$	$< 10^{-3}$
204		$< 10^{-3}$
205	26.101	
206	$< 10^{-3}$	
208	1.721	45.174
209	$< 10^{-3}$	
211	16.220	30.237
212	63.446	36.059
213		0.168
221	$< 10^{-3}$	17.810
228		$< 10^{-3}$
229	14.927	34.618
232		19.230
239	$< 10^{-3}$	
240		$< 10^{-3}$
242	34.511	1.613
246	$< 10^{-3}$	$< 10^{-3}$
249	1.594	$< 10^{-3}$
252	$< 10^{-3}$	$< 10^{-3}$
262		27.023
263	$< 10^{-3}$	6.473
270	$< 10^{-3}$	
301	77.470	35.507
307		21.399
310	2.102	7.836
311	1.544	
312	7.420	4.578
313	25.730	41.647
314		$< 10^{-3}$
316	27.089	33.591
317	2.909	8.939
318		7.527
319	20.462	17.917
320	29.210	6.300
321	$< 10^{-3}$	6.550
322		46.784
323	0.601	20.513
324	10.933	24.410
325	26.380	7.029
327		1.988
339		10.491
360		0.516
364		$< 10^{-3}$

375		21.545
376		57.865
378	$< 10^{-3}$	
380	11.557	26.990
384	0.422	
388		38.764
390	5.296	32.291
396		$< 10^{-3}$
401	50.198	60.001
421		4.628
425	$< 10^{-3}$	71.837
428	$< 10^{-3}$	
429		$< 10^{-3}$
435	29.738	3.630
437		50.107
438	2.539	
439	$< 10^{-3}$	10.161
444	1.656	
446	2.549	
449	$< 10^{-3}$	45.538
451		21.586
452	28.344	1.321
457	$< 10^{-3}$	26.673
458	1.550	0.422
459	2.674	0.166
461	$< 10^{-3}$	54.477
462	0.012	$< 10^{-3}$
465		$< 10^{-3}$
471	$< 10^{-3}$	$< 10^{-3}$
489		40.659
490	0.187	27.973
492	2.549	$< 10^{-3}$
501	$< 10^{-3}$	2.882
502	353.926	133.193
503	38.777	23.038
504	$< 10^{-3}$	1.042
506	4.967	37.938
508	0.594	$< 10^{-3}$
509		2.669
510	$< 10^{-3}$	42.498
511	43.905	$< 10^{-3}$
512	4.531	8.799
516		1.000
526	0.910	$< 10^{-3}$

527	$< 10^{-3}$	
530	0.276	25.368
538	2.619	$< 10^{-3}$
541		$< 10^{-3}$
546	$< 10^{-3}$	$< 10^{-3}$
551	$< 10^{-3}$	1.266
552	2.117	0.539
556	2.549	$< 10^{-3}$
557	0.012	$< 10^{-3}$
563	$< 10^{-3}$	$< 10^{-3}$
564	1.089	2.965
567		$< 10^{-3}$
568		$< 10^{-3}$
570		$< 10^{-3}$
573	$< 10^{-3}$	
579	$< 10^{-3}$	$< 10^{-3}$
596	0.670	
599		$< 10^{-3}$
604	61.102	1.018
617	2.549	$< 10^{-3}$
625	9.752	
627	$< 10^{-3}$	$< 10^{-3}$
631	0.450	40.322
640	$< 10^{-3}$	122.923
646		$< 10^{-3}$
648		$< 10^{-3}$
651	$< 10^{-3}$	48.632
652	$< 10^{-3}$	11.461
654		0.613
659		53.302
694	$< 10^{-3}$	$< 10^{-3}$
700	1.105	$< 10^{-3}$
726	0.964	43.771
735	11.045	20.716
739	9.680	
744		$< 10^{-3}$
745	$< 10^{-3}$	$< 10^{-3}$
749	0.062	
754	3.574	
759		28.093
760	0.812	0.594
762		$< 10^{-3}$
763	18.875	

766	1.178	$< 10^{-3}$
768		44.458
769	$< 10^{-3}$	48.424
773		10.631
780	2.438	
786	0.594	$< 10^{-3}$
789		$< 10^{-3}$
793		28.940
794		$< 10^{-3}$
795	33.488	22.718
820	29.562	0.556
830		$< 10^{-3}$
832	$< 10^{-3}$	$< 10^{-3}$
833		$< 10^{-3}$
843	$< 10^{-3}$	35.408
849	1.234	$< 10^{-3}$
852	$< 10^{-3}$	43.277
856		5.400
857	$< 10^{-3}$	45.039
858		$< 10^{-3}$
860		$< 10^{-3}$
861	$< 10^{-3}$	$< 10^{-3}$
862	1.148	$< 10^{-3}$
865		$< 10^{-3}$
866	$< 10^{-3}$	36.433
869	1.178	$< 10^{-3}$
873	0.766	
876	$< 10^{-3}$	$< 10^{-3}$
880		1.365
896	$< 10^{-3}$	24.063
910	0.834	24.282
950	32.430	

Table 46. P-values for likelihood ratio test statistics comparing weight models in Table 4 where the weights are assumed to be gamma random variables, by species (SVSPP code). Tests were not possible where values are missing. Species where all tests were not possible are omitted.

SVSPP	M_1 to M_2	M_2 to M_3
1	0.0025	$< 10^{-4}$
2	1.0000	0.9964

3		1.0000
4	1.0000	0.1615
7	0.4738	1.0000
9	1.0000	$< 10^{-4}$
12		1.0000
13	$< 10^{-4}$	0.4736
14	$< 10^{-4}$	$< 10^{-4}$
15	$< 10^{-4}$	$< 10^{-4}$
16		0.0019
18		$< 10^{-4}$
19	1.0000	$< 10^{-4}$
21	0.0525	$< 10^{-4}$
22	$< 10^{-4}$	0.0003
23	$< 10^{-4}$	$< 10^{-4}$
24	0.0001	0.0001
25	1.0000	0.5560
26	$< 10^{-4}$	0.0780
27	0.0327	0.0052
28	$< 10^{-4}$	0.4844
29	1.0000	0.8314
30	0.0001	0.9593
31		$< 10^{-4}$
32	$< 10^{-4}$	$< 10^{-4}$
33	$< 10^{-4}$	$< 10^{-4}$
34	$< 10^{-4}$	$< 10^{-4}$
35	0.0034	0.0005
36	0.0001	0.0348
43	$< 10^{-4}$	$< 10^{-4}$
44		$< 10^{-4}$
46	0.0001	$< 10^{-4}$
56	$< 10^{-4}$	0.0075
60	$< 10^{-4}$	
63	0.9806	
65	1.0000	1.0000
66	0.9211	1.0000
67	0.4738	1.0000
69	1.0000	$< 10^{-4}$
72	0.0155	$< 10^{-4}$
73	0.0323	0.0132
74	$< 10^{-4}$	$< 10^{-4}$
75	$< 10^{-4}$	0.0019
76	$< 10^{-4}$	0.3157
77	$< 10^{-4}$	$< 10^{-4}$

78	$< 10^{-4}$	$< 10^{-4}$
79	$< 10^{-4}$	0.6985
83	0.0136	0.2229
84	0.1040	0.0139
87	0.2510	0.0085
90	1.0000	0.0466
91	1.0000	1.0000
99		$< 10^{-4}$
101	0.0042	0.4782
102	$< 10^{-4}$	$< 10^{-4}$
103	$< 10^{-4}$	$< 10^{-4}$
104	$< 10^{-4}$	$< 10^{-4}$
105	0.2128	$< 10^{-4}$
106	0.0101	0.0003
107	$< 10^{-4}$	0.0137
108	$< 10^{-4}$	$< 10^{-4}$
109	$< 10^{-4}$	$< 10^{-4}$
111		$< 10^{-4}$
112	$< 10^{-4}$	0.0004
113	$< 10^{-4}$	
114		$< 10^{-4}$
115		0.9004
116	0.9058	
117	$< 10^{-4}$	$< 10^{-4}$
118	1.0000	0.9879
120	1.0000	$< 10^{-4}$
121	$< 10^{-4}$	$< 10^{-4}$
124		1.0000
126	1.0000	$< 10^{-4}$
127	0.0831	
129		1.0000
131	$< 10^{-4}$	$< 10^{-4}$
132	$< 10^{-4}$	0.3819
133	1.0000	1.0000
134		1.0000
135	$< 10^{-4}$	$< 10^{-4}$
136		$< 10^{-4}$
137		0.6979
139	0.2652	0.0340
141	$< 10^{-4}$	$< 10^{-4}$
142	1.0000	$< 10^{-4}$
143	0.0080	$< 10^{-4}$
145	1.0000	$< 10^{-4}$

146		0.0009
148		$< 10^{-4}$
149		$< 10^{-4}$
151	$< 10^{-4}$	0.0270
154	$< 10^{-4}$	
155	0.2342	$< 10^{-4}$
156	$< 10^{-4}$	0.0007
158	0.5032	0.0008
159	$< 10^{-4}$	
160	0.7411	
161	$< 10^{-4}$	0.1408
163	$< 10^{-4}$	0.4591
164	$< 10^{-4}$	$< 10^{-4}$
165	0.0013	0.0022
166	1.0000	1.0000
168	0.2008	0.8465
170	1.0000	
171	$< 10^{-4}$	$< 10^{-4}$
172	0.0002	$< 10^{-4}$
173	$< 10^{-4}$	0.7833
174	1.0000	$< 10^{-4}$
175		1.0000
176	0.3626	0.4630
177	0.0001	$< 10^{-4}$
179	1.0000	0.3447
180	$< 10^{-4}$	$< 10^{-4}$
181	$< 10^{-4}$	$< 10^{-4}$
183	0.0002	0.7847
184		$< 10^{-4}$
186		0.9804
187	0.7488	
188	1.0000	$< 10^{-4}$
190		0.7980
191	$< 10^{-4}$	$< 10^{-4}$
192	0.2449	$< 10^{-4}$
193	0.0002	$< 10^{-4}$
194	$< 10^{-4}$	0.5424
195	1.0000	1.0000
196	$< 10^{-4}$	0.0846
197	$< 10^{-4}$	$< 10^{-4}$
198	1.0000	1.0000
199		0.7407
201		$< 10^{-4}$

202	1.0000	$< 10^{-4}$
203	1.0000	1.0000
204		1.0000
205	$< 10^{-4}$	
206	1.0000	
208	0.7869	$< 10^{-4}$
209	1.0000	
211	0.0027	$< 10^{-4}$
212	$< 10^{-4}$	$< 10^{-4}$
213		0.9967
221	1.0000	0.0013
228		1.0000
229	0.0049	$< 10^{-4}$
232		0.0007
239	1.0000	
240		1.0000
242	$< 10^{-4}$	0.8065
246	1.0000	1.0000
249	0.8099	1.0000
252	1.0000	1.0000
262		$< 10^{-4}$
263	1.0000	0.1665
270	1.0000	
301	$< 10^{-4}$	$< 10^{-4}$
307		0.0003
310	0.7170	0.0978
311	0.8188	
312	0.1153	0.3334
313	$< 10^{-4}$	$< 10^{-4}$
314		1.0000
316	$< 10^{-4}$	$< 10^{-4}$
317	0.5732	0.0626
318		0.1105
319	0.0004	0.0013
320	$< 10^{-4}$	0.1778
321	1.0000	0.1617
322		$< 10^{-4}$
323	0.9630	0.0004
324	0.0273	0.0001
325	$< 10^{-4}$	0.1344
327		0.7380
339		0.0329
360		0.9719
364		1.0000

375		0.0002
376		$< 10^{-4}$
378	1.0000	
380	0.0210	$< 10^{-4}$
384	0.9806	
388		$< 10^{-4}$
390	0.2583	$< 10^{-4}$
396		1.0000
401	$< 10^{-4}$	$< 10^{-4}$
421		0.3276
425	1.0000	$< 10^{-4}$
428	1.0000	
429		1.0000
435	$< 10^{-4}$	0.4584
437		$< 10^{-4}$
438	0.6377	
439	1.0000	0.0378
444	0.7987	
446	0.6359	
449	1.0000	$< 10^{-4}$
451		0.0002
452	$< 10^{-4}$	0.8578
457	1.0000	$< 10^{-4}$
458	0.8177	0.9806
459	0.6138	0.9967
461	1.0000	$< 10^{-4}$
462	1.0000	1.0000
465		1.0000
471	1.0000	1.0000
489		$< 10^{-4}$
490	0.9959	$< 10^{-4}$
492	0.6359	1.0000
501	1.0000	0.5778
502	$< 10^{-4}$	$< 10^{-4}$
503	$< 10^{-4}$	0.0001
504	1.0000	0.9034
506	0.2907	$< 10^{-4}$
508	0.9637	1.0000
509		0.6147
510	1.0000	$< 10^{-4}$
511	$< 10^{-4}$	1.0000
512	0.3389	0.0663
516		0.9098
526	0.9231	1.0000

527	1.0000	
530	0.9913	$< 10^{-4}$
538	0.6235	1.0000
541		1.0000
546	1.0000	1.0000
551	1.0000	0.8671
552	0.7142	0.9696
556	0.6359	1.0000
557	1.0000	1.0000
563	1.0000	1.0000
564	0.8960	0.5637
567		1.0000
568		1.0000
570		1.0000
573	1.0000	
579	1.0000	1.0000
596	0.9550	
599		1.0000
604	$< 10^{-4}$	0.9071
617	0.6359	1.0000
625	0.0448	
627	1.0000	1.0000
631	0.9782	$< 10^{-4}$
640	1.0000	$< 10^{-4}$
646		1.0000
648		1.0000
651	1.0000	$< 10^{-4}$
652	1.0000	0.0218
654		0.9616
659		$< 10^{-4}$
694	1.0000	1.0000
700	0.8935	1.0000
726	0.9152	$< 10^{-4}$
735	0.0261	0.0004
739	0.0462	
744		1.0000
745	1.0000	1.0000
749	0.9995	
754	0.4667	
759		$< 10^{-4}$
760	0.9368	0.9637
762		1.0000
763	0.0008	
766	0.8817	1.0000
768		$< 10^{-4}$

769	1.0000	$< 10^{-4}$
773		0.0310
780	0.6558	
786	0.9637	1.0000
789		1.0000
793		$< 10^{-4}$
794		1.0000
795	$< 10^{-4}$	0.0001
820	$< 10^{-4}$	0.9678
830		1.0000
832	1.0000	1.0000
833		1.0000
843	1.0000	$< 10^{-4}$
849	0.8725	1.0000
852	1.0000	$< 10^{-4}$
856		0.2487
857	1.0000	$< 10^{-4}$
858		1.0000
860		1.0000
861	1.0000	1.0000
862	0.8866	1.0000
865		1.0000
866	1.0000	$< 10^{-4}$
869	0.8817	1.0000
873	0.9429	
876	1.0000	1.0000
880		0.8503
896	1.0000	0.0001
910	0.9338	0.0001
950	$< 10^{-4}$	

Table 46. AIC$_c$ values for each of the weight models in Table 4 where the weights are assumed to be gamma random variables, by species (SVSPP code). Fit was not possible where values are missing. Species where all values are missing are omitted.

SVSPP	M_1	M_2	M_3
1	-174.75	-181.26	-195.56
4	345.96	358.17	368.26
9	86.38		
13	1048.44	972.66	978.37
14	183.21	164.53	85.24
15	7638.55	7314.77	7219.78

16	264.60	276.98	277.09
18	341.02	352.65	337.99
19	315.72	327.47	289.50
21	75.79	210.42	
22	1458.34	1425.25	1413.11
23	3631.18	3565.56	3487.51
24	598.32	582.30	568.14
25	43.66	54.66	65.40
26	3703.83	3670.38	3670.25
27	496.49	494.59	488.82
28	761.00	733.17	738.85
29	64.82	208.82	
31	230.02	979.04	149.35
32	2372.60	1954.32	1565.29
33	902.17	765.96	698.40
34	252.66	197.40	175.65
35	-0.37	-7.11	-17.55
36	8.80	3.33	32.45
43	114.22	52.27	-8.85
44	99.15	108.84	89.15
46	1.89	-2.77	-6.78
56	-309.65	-346.87	-348.61
60	-68.08	-67.29	
69	15.08	34.62	17.98
72	4991.19	4987.04	4824.27
73	1678.23	1676.11	1672.16
74	3060.67	3013.46	2986.73
75	696.75	594.16	587.07
76	1890.77	1874.05	1877.85
77	1922.28	1874.42	1804.11
78	1940.02	1814.32	1195.31
79	-51.97	-74.73	-59.84
83	-258.20	-261.36	-256.58
84	75.73	81.89	90.59
87	-161.50	-148.45	-122.63
90	-71.10	-52.68	-22.85
91	-6.67		
101	148.18	147.11	165.90
102	1293.68	1223.52	1139.47
103	1617.82	1581.46	1558.42
104	1113.87	1056.87	1037.62
105	1049.78	1052.26	996.64
106	1463.99	1459.08	1446.29
107	537.50	465.87	462.02
108	409.72	386.44	362.40
109	-137.73	-167.55	-197.48

112	14.24	-8.08	-3.72
113	-43.70		
114	-46.39		
117	-336.52	-374.54	-388.70
121	768.17	732.57	582.71
124	-3.63	140.37	
126	47.97	72.91	114.55
129	-45.42	-34.03	-19.39
131	3514.68	3246.48	3143.45
132	-172.19	-226.27	-216.29
135	1042.95	932.97	891.03
136	744.33	753.56	711.18
139	218.90	226.06	232.74
141	278.09	255.42	185.16
142	-30.22	-13.49	-35.66
143	1498.71	1493.35	1399.38
145	436.16	445.42	392.43
146	18.20	31.46	32.19
148	31.67		
149	627.68	636.78	584.95
151	29.19		
155	1751.05	1753.90	1687.50
156	242.37	215.01	205.82
158	-36.66	-15.06	57.43
159	-145.25	-163.11	-108.68
161	-187.40	-210.80	-204.48
163	1214.86	1187.12	1191.93
164	1046.66	1001.35	921.66
165	-690.79	-699.17	-705.17
166	-41.88		
168	66.20	72.27	87.11
170	-96.90	-23.57	
171	325.86	206.50	182.22
172	217.61	205.11	179.88
173	-19.87	-31.85	-4.68
174	-68.55	-53.55	-95.37
176	69.26	78.18	94.08
177	35.45		
179	39.58	67.58	203.10
181	-360.58	-526.09	-571.39
187	-10.95		
188	-110.42	-93.70	-121.78
191	-4.06	-12.09	-13.85
192	66.39	77.67	83.40
193	828.12	814.17	746.00
194	-162.91	-195.58	-187.78

196	-91.79	-168.27	-162.72
197	1896.20	1841.05	1793.85
198	1.92	34.28	325.48
201	-98.75	-82.02	-107.00
202	14.69	47.05	310.53
204	-8.55	135.45	
205	-52.32	-50.42	90.35
209	-101.20	-89.16	-72.93
211	-58.22	-63.25	-79.33
212	-193.66	-246.87	-270.84
221	-188.20	-175.19	-174.22
229	-276.75	-278.90	-295.35
232	-122.14	-104.64	-88.87
242	-39.02		
262	-39.34		
263	-47.30	-8.30	
270	82.25	226.25	
301	1595.87	1526.69	1499.65
307	-116.95	-107.01	-116.91
310	8.01	25.45	63.21
311	-77.06		
312	-114.99	-113.78	-109.31
313	-842.50	-859.86	-892.90
314	-21.35	28.94	
316	-92.46	-104.05	-110.88
317	-273.52	-266.59	-264.24
318	226.28	236.51	241.07
319	-143.41	-151.83	-153.52
320	-224.26	-242.47	-235.02
321	-76.17	-61.61	-44.63
322	197.89	207.66	172.05
323	-77.27	66.13	
324	-12.42	-7.29	-2.78
325	3.04	120.66	
360	146.15	160.33	182.11
375	292.16	305.42	303.37
376	134.48	154.03	141.76
390	-30.41	-23.50	-39.15
401	2210.98	2168.99	2117.32
421	-248.00	-234.74	-219.88
425	0.22		
428	68.82	79.91	93.86
429	-57.43	-40.71	-9.12
435	3.65	-15.65	-6.75
439	-10.01	12.66	70.49
461	-34.75		

489	-6.90	14.03	27.77
501	-68.84	-29.84	
502	777.84	432.12	307.26
503	4668.43	4637.79	4622.98
504	-66.20	7.13	
506	-590.22	-585.90	-613.59
512	-612.92	-608.65	-608.09
570	16.93		
573	-26.97		
604	-21.47		
640	12.91	25.92	-78.22
651	48.60	60.98	29.44
652	111.53	122.15	123.61
657	-42.30		
659	10.77	84.10	
694	-81.89	-65.17	-33.58
735	-29.00		
745	32.51	48.57	77.48
759	-92.10	-72.56	-55.05
773	-28.83		
780			
793	-3.12	21.82	84.31
795	-193.10	-215.30	-223.62
820	-27.34	-17.90	
852	-16.58		
865	-14.53	129.47	
896	-63.49	80.51	

Table 47. Using model M_1, species-specific gamma MLEs of mean weight ρ across all stations, standard errors, and 95% confidence intervals.

SVSPP	$\widehat{\rho}$	$SE(\widehat{\rho})$	$CI_L(\widehat{\rho})$	$CI_U(\widehat{\rho})$
1	1.2716	0.1512	1.0074	1.6053
4	1.4097	0.3599	0.8547	2.3250
9	0.2283	0.1237	0.0790	0.6601
13	0.9325	0.0918	0.7689	1.1309
14	0.5879	0.1074	0.4110	0.8409
15	0.9630	0.0276	0.9104	1.0187
16	1.1536	0.3238	0.6655	1.9999
18	0.5630	0.1668	0.3150	1.0061
19	0.5740	0.1585	0.3341	0.9862
21	1.5412	1.0539	0.4034	5.8877
22	0.8246	0.0952	0.6577	1.0339

23	0.9075	0.0385	0.8350	0.9863
24	0.9253	0.0390	0.8519	1.0049
25	1.7063	0.4272	1.0445	2.7873
26	0.9438	0.0232	0.8994	0.9905
27	1.0149	0.1079	0.8240	1.2499
28	0.9563	0.1234	0.7427	1.2315
29	0.3975	0.1463	0.1932	0.8176
31	1.1434	0.0430	1.0622	1.2307
32	1.2179	0.0940	1.0468	1.4168
33	0.8316	0.0716	0.7024	0.9846
34	1.6434	0.2078	1.2826	2.1057
35	0.4286	0.0590	0.3272	0.5615
36	0.9901	0.1464	0.7410	1.3228
43	1.5959	0.1412	1.3418	1.8982
44	1.3809	0.1175	1.1687	1.6316
46	1.7944	1.1794	0.4948	6.5072
56	1.5057	0.0815	1.3540	1.6743
60	4.1366	3.4820	0.7946	21.5346
69	1.1073	0.1859	0.7968	1.5389
72	0.8495	0.0401	0.7744	0.9318
73	0.7950	0.0588	0.6877	0.9191
74	0.9607	0.0359	0.8928	1.0338
75	0.1879	0.0295	0.1381	0.2557
76	0.9341	0.0829	0.7850	1.1115
77	0.9989	0.0431	0.9178	1.0871
78	0.9057	0.0843	0.7546	1.0871
79	0.5769	0.1666	0.3276	1.0160
83	1.0700	0.1532	0.8082	1.4167
84	0.6938	0.2070	0.3866	1.2451
87	0.7639	0.1732	0.4898	1.1915
90	2.0332	0.4910	1.2666	3.2639
91	0.5438	0.1797	0.2846	1.0393
99	0.5999	0.5281	0.1069	3.3682
101	1.2964	0.5038	0.6053	2.7767
102	0.8032	0.0404	0.7277	0.8865
103	0.9857	0.0583	0.8778	1.1067
104	0.9444	0.0286	0.8900	1.0022
105	0.9872	0.0239	0.9415	1.0351
106	0.8377	0.0541	0.7381	0.9507
107	1.0000	0.0844	0.8475	1.1800
108	0.9056	0.0552	0.8036	1.0205
109	1.4788	0.1168	1.2668	1.7263
112	0.8246	0.4209	0.3032	2.2426
113	1.7541	0.1426	1.4957	2.0570
114	1.7843	0.7332	0.7974	3.9925
117	4.4955	0.7684	3.2157	6.2846

121	0.7309	0.0368	0.6622	0.8068
124	0.7943	0.1494	0.5494	1.1484
126	10.1510	6.0528	3.1547	32.6634
129	1.0582	0.1111	0.8614	1.3000
131	1.3524	0.0819	1.2011	1.5228
132	1.0271	0.2968	0.5830	1.8097
135	0.5733	0.1017	0.4049	0.8116
136	0.9925	0.0727	0.8598	1.1458
139	1.1163	0.1437	0.8675	1.4366
141	0.8275	0.1093	0.6388	1.0719
142	1.3885	0.2009	1.0457	1.8437
143	0.7897	0.0500	0.6974	0.8941
145	1.2648	0.0910	1.0984	1.4563
146	0.9407	0.2436	0.5663	1.5628
148	0.7134	0.3249	0.2922	1.7419
149	0.9965	0.0497	0.9037	1.0988
151	1.3213	0.3750	0.7576	2.3045
155	0.8177	0.0406	0.7418	0.9012
156	0.7088	0.1224	0.5053	0.9943
158	0.7391	0.3008	0.3329	1.6412
159	1.0161	0.1354	0.7825	1.3194
161	0.8765	0.1221	0.6671	1.1516
163	0.8695	0.0385	0.7972	0.9484
164	0.7513	0.0838	0.6038	0.9348
165	1.7736	0.1975	1.4259	2.2061
168	0.5957	0.2674	0.2471	1.4359
170	14.0903	5.0075	7.0213	28.2763
171	0.7252	0.0614	0.6142	0.8562
172	0.5773	0.0926	0.4215	0.7907
173	0.9089	0.2121	0.5752	1.4362
174	15.7228	3.9758	9.5782	25.8092
176	0.7263	0.2375	0.3826	1.3787
177	0.3688	0.1170	0.1981	0.6867
179	1.6226	0.4471	0.9455	2.7844
181	0.3866	0.0255	0.3396	0.4400
187	0.8008	0.1012	0.6251	1.0258
188	0.7258	0.2158	0.4053	1.2999
191	0.2187	0.1048	0.0855	0.5597
192	1.8131	1.0290	0.5961	5.5145
193	0.8549	0.0674	0.7326	0.9977
194	1.3291	0.0801	1.1811	1.4957
196	1.0019	0.2510	0.6131	1.6372
197	1.1308	0.1540	0.8658	1.4768
198	0.7065	0.3742	0.2502	1.9949
201	1.1924	0.2397	0.8042	1.7681
202	0.8973	0.7038	0.1929	4.1740

204	1.1405	0.1359	0.9030	1.4406
205	0.8164	0.0759	0.6804	0.9796
209	1.2157	0.1000	1.0347	1.4283
211	1.2415	0.1574	0.9683	1.5918
212	1.2250	0.1259	1.0015	1.4984
221	9.9371	1.7639	7.0172	14.0719
229	1.9723	0.1440	1.7094	2.2757
232	1.2469	0.2373	0.8587	1.8107
242	1.6918	0.2737	1.2320	2.3231
262	1.5775	0.2213	1.1983	2.0768
263	2.3817	0.8435	1.1897	4.7681
270	0.9383	0.3810	0.4234	2.0796
301	0.8762	0.0523	0.7794	0.9850
307	1.6242	0.3865	1.0187	2.5895
310	0.8981	0.2909	0.4761	1.6943
311	11.7242	1.6723	8.8648	15.5058
312	1.3512	0.1890	1.0272	1.7774
313	1.0131	0.1110	0.8173	1.2559
314	1.0742	0.1786	0.7754	1.4879
316	2.6322	0.5193	1.7880	3.8748
317	0.5772	0.1874	0.3054	1.0908
318	1.4999	0.2172	1.1293	1.9920
319	1.9402	0.4200	1.2693	2.9657
320	0.9148	0.0795	0.7715	1.0847
321	0.8356	0.1504	0.5873	1.1890
322	2.5196	0.6228	1.5521	4.0902
323	1.3032	0.1617	1.0218	1.6621
324	1.3560	0.4477	0.7099	2.5901
325	1.5021	0.5879	0.6975	3.2348
360	1.0745	0.1545	0.8106	1.4244
375	0.8559	0.2492	0.4837	1.5146
376	0.9887	0.2835	0.5637	1.7342
390	1.7079	0.6062	0.8518	3.4244
401	0.7317	0.0360	0.6645	0.8058
421	2.1905	0.5664	1.3196	3.6362
425	0.4231	0.1671	0.1951	0.9173
428	1.1191	0.1621	0.8425	1.4865
429	1.3209	0.2000	0.9817	1.7772
435	1.7575	0.4070	1.1163	2.7671
439	0.9402	0.1709	0.6584	1.3425
461	7.2471	2.6351	3.5535	14.7797
489	0.3657	0.1906	0.1317	1.0157
501	9.9912	4.6088	4.0455	24.6754
502	1.0215	0.0578	0.9142	1.1414
503	1.2904	0.0611	1.1760	1.4158
504	1.1539	0.2022	0.8185	1.6267

506	1.0059	0.0887	0.8462	1.1957
512	0.8987	0.0726	0.7671	1.0528
530	0.4739	0.2555	0.1647	1.3635
563	1.2541	0.3667	0.7071	2.2243
567	0.4540	0.5455	0.0431	4.7850
570	1.1444	0.2363	0.7636	1.7152
573	0.9416	0.0425	0.8618	1.0287
604	1.2823	0.7343	0.4174	3.9395
640	0.1559	0.0403	0.0939	0.2587
651	0.8601	0.0715	0.7309	1.0123
652	0.9765	0.0548	0.8748	1.0900
657	0.8880	0.1821	0.5941	1.3274
659	0.7450	0.1859	0.4568	1.2149
694	0.8709	0.1052	0.6872	1.1037
735	1.2847	0.1117	1.0833	1.5234
745	1.1283	0.0850	0.9734	1.3078
759	0.5040	0.2244	0.2106	1.2062
773	4.0399	1.8065	1.6817	9.7049
793	1.0286	0.2788	0.6047	1.7495
795	9.2615	1.7883	6.3433	13.5220
820	1.1279	0.8920	0.2394	5.3137
852	3.0712	0.7770	1.8705	5.0425
865	6.4699	0.3864	5.7552	7.2733
896	1.0863	0.2290	0.7186	1.6421

Table 48. Using model M_2, species-specific gamma MLEs of mean weight ρ for survey stations, standard errors, and 95% confidence intervals.

SVSPP	$\widehat{\rho}$	$SE(\widehat{\rho})$	$CI_L(\widehat{\rho})$	$CI_U(\widehat{\rho})$
1	1.1595	0.1860	0.8467	1.5879
13	0.9305	0.1111	0.7363	1.1759
14	0.5091	0.1140	0.3282	0.7898
15	0.9804	0.0430	0.8996	1.0685
22	0.7588	0.1117	0.5687	1.0126
23	0.8307	0.0481	0.7416	0.9306
26	0.9077	0.0287	0.8531	0.9657
27	1.2412	0.1704	0.9483	1.6245
28	0.8560	0.2325	0.5027	1.4576
32	1.3943	0.1582	1.1163	1.7414
33	0.8776	0.0992	0.7031	1.0953
34	0.8757	0.1328	0.6505	1.1788
35	0.4207	0.0631	0.3135	0.5645
43	1.6385	0.0883	1.4743	1.8210

56	1.5013	0.0745	1.3621	1.6547
60	7.7380	4.0240	2.7924	21.4426
72	0.8644	0.0563	0.7609	0.9821
73	0.8254	0.0858	0.6732	1.0120
74	0.8782	0.0577	0.7721	0.9989
75	0.7095	0.1485	0.4708	1.0692
76	0.8628	0.1013	0.6854	1.0860
77	1.0372	0.0681	0.9121	1.1796
78	0.8792	0.0918	0.7165	1.0788
79	0.5634	0.0645	0.4502	0.7052
83	1.2438	0.2445	0.8462	1.8284
84	0.4680	0.1718	0.2279	0.9610
87	0.6907	0.1553	0.4445	1.0733
101	1.3037	0.4608	0.6521	2.6063
102	0.8276	0.0646	0.7101	0.9646
103	0.9214	0.0712	0.7919	1.0722
104	0.9323	0.0393	0.8584	1.0125
105	1.0013	0.0304	0.9433	1.0628
106	0.7613	0.0622	0.6487	0.8935
107	0.9562	0.0993	0.7802	1.1720
108	0.9472	0.0632	0.8311	1.0795
109	1.6693	0.1950	1.3277	2.0987
112	1.2553	0.6152	0.4804	3.2802
117	5.0851	0.7834	3.7598	6.8775
121	0.7310	0.0442	0.6493	0.8231
131	1.0928	0.0603	0.9808	1.2175
135	0.5289	0.0983	0.3675	0.7613
139	1.0826	0.1664	0.8010	1.4633
141	0.8869	0.1439	0.6453	1.2191
143	0.7915	0.0514	0.6970	0.8989
155	0.8310	0.0509	0.7370	0.9369
156	0.6954	0.1320	0.4794	1.0088
159	1.3640	0.1300	1.1316	1.6442
161	0.9143	0.1111	0.7205	1.1603
163	0.8655	0.0383	0.7936	0.9440
164	0.7578	0.1166	0.5604	1.0246
165	2.5475	0.3768	1.9064	3.4042
168	0.6178	0.2660	0.2657	1.4365
171	0.7461	0.0792	0.6059	0.9187
172	0.5517	0.0939	0.3952	0.7701
176	0.5639	0.2245	0.2584	1.2305
181	0.9614	0.1747	0.6733	1.3727
191	0.2471	0.2048	0.0487	1.2539
192	1.1507	1.3000	0.1257	10.5337
193	0.9070	0.0921	0.7434	1.1067
194	1.3276	0.0953	1.1533	1.5282

196	1.0305	0.1696	0.7463	1.4229
197	1.1004	0.1992	0.7717	1.5691
229	2.1249	0.2011	1.7652	2.5580
301	0.8386	0.0624	0.7248	0.9703
312	1.3453	0.2287	0.9640	1.8773
313	1.0454	0.1289	0.8209	1.3312
317	0.5017	0.1816	0.2469	1.0198
324	0.7006	0.3017	0.3012	1.6293
401	0.7892	0.0431	0.7091	0.8782
502	0.8201	0.0622	0.7068	0.9517
503	1.3618	0.0829	1.2087	1.5343
506	1.0649	0.0927	0.8978	1.2630
512	0.9167	0.0804	0.7719	1.0887
795	8.2106	1.2395	6.1077	11.0374

Table 49. Using model M_2, species-specific gamma MLEs of mean weight ρ for site-specific stations, standard errors, and 95% confidence intervals.

SVSPP	$\widehat{\rho}$	$SE(\widehat{\rho})$	$CI_L(\widehat{\rho})$	$CI_U(\widehat{\rho})$
1	1.3830	0.2101	1.0268	1.8627
13	0.9538	0.0575	0.8476	1.0735
14	0.8909	0.0804	0.7465	1.0632
15	0.9556	0.0211	0.9152	0.9978
22	0.9147	0.1683	0.6377	1.3120
23	1.0945	0.0611	0.9811	1.2210
26	1.0231	0.0384	0.9505	1.1012
27	0.7446	0.1247	0.5362	1.0338
28	0.9441	0.1199	0.7360	1.2109
32	0.9036	0.0258	0.8544	0.9556
33	0.9350	0.0903	0.7737	1.1298
34	3.3814	0.6079	2.3772	4.8097
35	0.5258	0.1363	0.3163	0.8740
43	1.0277	0.0559	0.9237	1.1433
56	1.2433	0.0555	1.1391	1.3570
60	0.6488	0.5865	0.1103	3.8163
72	0.8212	0.0551	0.7200	0.9367
73	0.7503	0.0788	0.6108	0.9217
74	0.9874	0.0389	0.9140	1.0666
75	0.2642	0.0507	0.1813	0.3849
76	1.1472	0.1443	0.8966	1.4679
77	0.9715	0.0484	0.8811	1.0712
78	1.3111	0.2215	0.9415	1.8257
79	1.1904	0.2300	0.8152	1.7384

83	0.8692	0.1050	0.6860	1.1013
84	1.1239	0.3645	0.5952	2.1224
87	1.5041	0.6734	0.6255	3.6169
101	4.4154	4.2090	0.6816	28.6010
102	0.7864	0.0406	0.7107	0.8703
103	1.1779	0.0867	1.0198	1.3606
104	0.9597	0.0335	0.8963	1.0277
105	0.9512	0.0389	0.8779	1.0306
106	1.0416	0.1124	0.8430	1.2870
107	1.0504	0.0973	0.8761	1.2595
108	0.8298	0.0984	0.6577	1.0470
109	1.3220	0.1340	1.0838	1.6125
112	1.9566	0.2401	1.5384	2.4885
117	1.4025	0.4769	0.7202	2.7311
121	0.8512	0.0775	0.7121	1.0175
131	3.0651	0.4575	2.2877	4.1066
135	2.2484	0.4203	1.5586	3.2433
139	1.3264	0.2517	0.9144	1.9241
141	0.6091	0.1299	0.4011	0.9251
143	0.7681	0.1447	0.5309	1.1112
155	0.7968	0.0676	0.6748	0.9408
156	1.3584	0.5227	0.6390	2.8876
159	0.7938	0.0607	0.6834	0.9220
161	0.5253	0.1029	0.3578	0.7712
163	0.8786	0.0753	0.7428	1.0392
164	0.7397	0.1081	0.5555	0.9849
165	1.1316	0.1479	0.8760	1.4619
168	0.0332	0.0425	0.0027	0.4089
171	0.6299	0.0664	0.5123	0.7744
172	1.4075	0.4648	0.7369	2.6885
176	1.0543	0.4623	0.4464	2.4901
181	0.4572	0.0398	0.3854	0.5423
191	0.3360	0.1539	0.1370	0.8243
192	2.2330	1.1800	0.7927	6.2905
193	0.7114	0.0889	0.5568	0.9089
194	1.2532	0.0612	1.1388	1.3790
196	2.0000	$\leq 10^{-4}$	1.9999	2.0001
197	1.1601	0.2111	0.8121	1.6573
229	1.0591	0.1558	0.7937	1.4131
301	1.0590	0.0892	0.8978	1.2491
312	1.3310	0.3169	0.8346	2.1225
313	0.8066	0.1730	0.5297	1.2281
317	0.7746	0.6275	0.1583	3.7895
324	4.0373	1.4353	2.0113	8.1042
401	0.3547	0.0465	0.2743	0.4586
502	1.1222	0.0566	1.0166	1.2388

503	1.1429	0.0798	0.9967	1.3105
506	0.6395	0.1632	0.3878	1.0545
512	0.7829	0.1660	0.5167	1.1864
795	3.7239	0.5476	2.7914	4.9680

Table 50. Using model M_3, species-specific gamma MLEs of mean weight ρ for spring stations, standard errors, and 95% confidence intervals.

SVSPP	$\widehat{\rho}$	$SE(\widehat{\rho})$	$CI_L(\widehat{\rho})$	$CI_U(\widehat{\rho})$
1	1.6367	0.2678	1.1878	2.2554
13	1.0135	0.1725	0.7261	1.4148
14	1.0509	0.0970	0.8770	1.2595
15	0.9698	0.0439	0.8874	1.0598
22	0.5657	0.1487	0.3380	0.9469
23	0.9729	0.0629	0.8571	1.1044
26	0.9044	0.0351	0.8381	0.9760
27	1.3259	0.1877	1.0046	1.7500
28	0.9552	0.2770	0.5411	1.6863
31	0.8813	0.0441	0.7989	0.9721
32	2.3586	0.3877	1.7090	3.2552
33	0.9069	0.1134	0.7098	1.1587
34	0.8856	0.1472	0.6394	1.2265
35	0.5378	0.1074	0.3636	0.7955
43	1.4334	0.0974	1.2546	1.6376
56	1.4288	0.2218	1.0540	1.9369
72	0.7307	0.0826	0.5855	0.9118
73	0.9553	0.1350	0.7242	1.2600
74	0.9041	0.0617	0.7910	1.0335
75	0.9562	0.1623	0.6855	1.3337
76	0.9580	0.1608	0.6894	1.3313
77	0.9376	0.0913	0.7748	1.1347
78	0.9073	0.1377	0.6739	1.2216
79	0.5605	0.3615	0.1583	1.9844
83	1.3705	0.3457	0.8359	2.2470
84	0.2110	0.0508	0.1316	0.3383
101	1.9752	1.1747	0.6157	6.3366
102	1.0085	0.0986	0.8327	1.2214
103	0.9505	0.0995	0.7741	1.1670
104	0.9844	0.0509	0.8895	1.0895
105	0.9563	0.0336	0.8927	1.0244
106	0.5508	0.0789	0.4160	0.7294
107	0.8851	0.1001	0.7092	1.1046
108	0.9269	0.1326	0.7002	1.2269

109	0.9618	0.1380	0.7261	1.2741
112	0.5129	0.0728	0.3884	0.6774
117	4.9618	0.7963	3.6227	6.7959
121	0.7582	0.0530	0.6611	0.8696
131	1.5840	0.1530	1.3109	1.9141
135	0.8211	0.2908	0.4102	1.6439
139	1.0918	0.1985	0.7645	1.5591
141	1.5754	0.5293	0.8155	3.0434
143	0.5108	0.1162	0.3271	0.7976
155	0.8982	0.0475	0.8098	0.9962
156	0.6204	0.1616	0.3723	1.0338
161	1.0782	0.2487	0.6861	1.6944
163	0.8386	0.0505	0.7453	0.9436
164	0.7475	0.0949	0.5829	0.9586
165	3.1670	0.7010	2.0523	4.8873
171	0.7709	0.1034	0.5927	1.0027
172	0.3515	0.1046	0.1961	0.6298
181	1.4626	0.3048	0.9721	2.2005
191	0.7908	0.0849	0.6407	0.9761
193	0.5022	0.0915	0.3514	0.7177
194	1.2684	0.1411	1.0199	1.5776
196	0.7302	0.5384	0.1721	3.0982
197	1.5525	0.3125	1.0463	2.3035
229	1.8750	0.0524	1.7749	1.9806
301	0.8098	0.0763	0.6732	0.9740
312	1.3146	0.5650	0.5662	3.0525
313	1.1559	0.2319	0.7801	1.7128
317	0.8099	0.4227	0.2912	2.2527
401	0.4666	0.0433	0.3890	0.5597
502	1.1126	0.1088	0.9184	1.3477
503	1.4062	0.1482	1.1438	1.7288
506	1.0315	0.0748	0.8948	1.1890
512	1.0091	0.1224	0.7956	1.2800
795	9.6864	1.3900	7.3116	12.8325

Table 51. Using model M_3, species-specific gamma MLEs of mean weight ρ for fall stations, standard errors, and 95% confidence intervals.

SVSPP	$\widehat{\rho}$	$SE(\widehat{\rho})$	$CI_L(\widehat{\rho})$	$CI_U(\widehat{\rho})$
1	1.4836	0.2459	1.0721	2.0529
13	0.8755	0.1408	0.6389	1.1999
14	0.2949	0.0938	0.1581	0.5501
15	1.0047	0.0774	0.8639	1.1684

22	0.9236	0.1592	0.6589	1.2947
23	0.8333	0.0680	0.7101	0.9780
26	0.8952	0.0520	0.7988	1.0032
27	1.1197	0.3637	0.5924	2.1165
28	0.7356	0.3606	0.2814	1.9227
31	1.1438	0.0186	1.1079	1.1808
32	0.9749	0.0305	0.9169	1.0367
33	0.8710	0.1224	0.6613	1.1472
34	1.0439	0.2858	0.6104	1.7851
35	0.3457	0.0781	0.2220	0.5382
43	1.5422	0.0682	1.4141	1.6818
56	1.4545	0.1087	1.2564	1.6838
72	0.9988	0.0679	0.8742	1.1411
73	0.6851	0.1029	0.5103	0.9196
74	0.8198	0.0840	0.6706	1.0023
75	0.4419	0.1594	0.2180	0.8960
76	0.8209	0.1298	0.6022	1.1191
77	1.1269	0.0940	0.9570	1.3271
78	1.0370	0.0487	0.9459	1.1369
79	0.5447	0.1517	0.3155	0.9402
83	0.9468	0.2420	0.5737	1.5625
84	0.8785	0.3974	0.3619	2.1321
101	0.9859	0.3834	0.4600	2.1129
102	0.7836	0.0816	0.6390	0.9609
103	0.8900	0.0980	0.7173	1.1043
104	0.9131	0.0553	0.8108	1.0282
105	1.0151	0.0461	0.9287	1.1095
106	0.9764	0.0918	0.8121	1.1741
107	1.0070	0.1772	0.7132	1.4217
108	0.9299	0.0564	0.8256	1.0473
109	2.1856	0.3564	1.5877	3.0086
112	0.7870	0.4747	0.2413	2.5667
117	1.3186	0.4398	0.6857	2.5353
121	0.9150	0.0736	0.7815	1.0714
131	0.9342	0.0574	0.8282	1.0538
135	0.4633	0.0860	0.3219	0.6666
139	0.9090	0.1680	0.6328	1.3057
141	0.6133	0.1041	0.4397	0.8553
143	0.8329	0.0529	0.7355	0.9433
155	0.7767	0.0612	0.6656	0.9063
156	1.2175	0.2654	0.7943	1.8664
161	0.8390	0.1118	0.6461	1.0894
163	0.8898	0.0574	0.7841	1.0097
164	0.8311	0.2028	0.5151	1.3408
165	2.1936	0.5267	1.3701	3.5120
171	0.7731	0.1139	0.5791	1.0320

172	0.8238	0.1500	0.5765	1.1772
181	0.5108	0.0983	0.3504	0.7448
193	1.1196	0.0930	0.9514	1.3175
194	1.3538	0.1265	1.1272	1.6259
196	0.9800	0.1344	0.7491	1.2822
197	0.8556	0.2074	0.5321	1.3758
229	2.1931	0.0850	2.0327	2.3661
301	0.8667	0.0866	0.7125	1.0541
312	1.3387	0.2399	0.9422	1.9021
313	0.9873	0.1317	0.7601	1.2824
317	0.4511	0.2201	0.1733	1.1740
401	0.9954	0.0599	0.8847	1.1200
502	0.8234	0.0649	0.7056	0.9609
503	1.4115	0.1038	1.2221	1.6303
506	8.6615	1.2916	6.4664	11.6017
512	0.8616	0.1048	0.6788	1.0937
795	8.0468	1.7837	5.2113	12.4251

Table 52. For each species, the numbers of total stations and stations during the spring and fall surveys where both vessels had catches $\left(+_A +_B\right)$. Species not present were observed by both vessels at fewer than 30 total stations.

Species	SVSPP	Total Stations	Spring Stations	Fall Stations
Smooth Dogfish	13	56	11	32
Spiny Dogfish	15	342	113	85
Barndoor Skate	22	56	11	20
Winter Skate	23	177	50	53
Clearnose Skate	24	48	21	27
Little Skate	26	252	76	81
Smooth Skate	27	50	12	13
Thorny Skate	28	49	10	9
Round Herring	31	33	2	30
Atlantic Herring	32	198	69	54
Alewife	33	93	48	20
Blueback Herring	34	49	31	5
Silver Hake	72	407	99	140
Atlantic Cod	73	94	27	22
Haddock	74	160	33	42
White Hake	76	128	26	55
Red Hake	77	283	62	101
Spotted Hake	78	161	59	73
American Plaice	102	152	31	45
Summer Flounder	103	146	51	63
Fourspot Flounder	104	192	45	77

Yellowtail Flounder	105	143	39	38
Winter Flounder	106	131	23	49
Witch Flounder	107	78	28	31
Windowpane	108	108	43	44
Gulf Stream Flounder	109	106	29	34
Atlantic Mackerel	121	61	34	11
Butterfish	131	278	54	149
Bluefish	135	53	2	46
Atlantic Croaker	136	42	5	37
Black Sea Bass	141	45	7	23
Scup	143	104	13	59
Weakfish	145	37	6	31
Spot	149	47	5	42
Acadian Redfish	155	117	20	50
Longhorn Sculpin	163	167	48	41
Sea Raven	164	96	28	30
Northern Searobin	171	82	23	30
Northern Sand Lance	181	40	10	10
Ocean Pout	193	100	32	23
Goosefish	197	76	17	35
American Lobster	301	116	32	57
Atlantic Rock Crab	313	87	34	39
Sea Scallop	401	204	52	80
Northern Shortfin Squid	502	195	19	93
Longfin Squid	503	346	74	165
Spoonarm Octopus	512	34	13	19

Table 53. For each species, the recommended type of estimator, resulting estimate, standard error based on data collected at all stations. Recommended type of estimator, resulting estimate of the numbers-based calibration factors and standard errors for either spring or fall surveys. These species were observed by both vessels at $\geq$30 total stations but <30 stations in either the fall or spring set of survey stations.

Species	SVSPP	Estimator	$\hat{\rho}$	$SE(\hat{\rho})$
Smooth Dogfish	13	Beta-binomial	1.161	0.153
Barndoor Skate	22	Beta-binomial	4.440	0.520
Clearnose Skate	24	Beta-binomial	6.689	0.839
Smooth Skate	27	Beta-binomial	4.384	0.627
Thorny Skate	28	Beta-binomial	3.792	0.540
Round Herring	31	Beta-binomial	1.227	0.252
Alewife	33	Beta-binomial	1.323	0.142
Blueback Herring	34	Beta-binomial	1.290	0.193
Atlantic Cod	73	Beta-binomial	1.987	0.194
White Hake	76	Beta-binomial	2.235	0.173
Winter Flounder	106	Beta-binomial	2.490	0.210
Witch Flounder	107	Beta-binomial	3.257	0.336
Gulf Stream Flounder	109	Beta-binomial	8.249	0.988
Atlantic Mackerel	121	Beta-binomial	1.188	0.157
Bluefish	135	Beta-binomial	1.160	0.165
Atlantic Croaker	136	Beta-binomial	1.134	0.204
Black Sea Bass	141	Beta-binomial	3.416	0.499
Scup	143	Ratio	1.705	0.198
Weakfish	145	Beta-binomial	1.577	0.267
Spot	149	Beta-binomial	1.541	0.247
Acadian Redfish	155	Beta-binomial	1.456	0.130
Sea Raven	164	Beta-binomial	1.802	0.158
Northern Searobin	171	Beta-binomial	4.494	0.502
Northern Sand Lance	181	Beta-binomial	0.570	0.087
Ocean Pout	193	Beta-binomial	4.575	0.450
Goosefish	197	Beta-binomial	7.129	0.793
Northern Shortfin Squid	502	Beta-binomial	1.380	0.103
Spoonarm Octopus	512	Beta-binomial	2.309	0.384

Table 54. For each species, the recommended type of estimator, resulting estimate, standard error and confidence intervals based on data collected at spring survey stations. These species were observed by both vessels at $\geq$ 30 stations in each of the spring and fall survey sets.

Species	SVSPP	Estimator	$\hat{\rho}$	$SE(\hat{\rho})$

Spiny Dogfish	15	Beta-binomial	1.202	0.078
Winter Skate	23	Beta-binomial	3.822	0.579
Little Skate	26	Ratio	3.080	0.328
Atlantic Herring	32	Beta-binomial	2.287	0.335
Silver Hake	72	Beta-binomial	6.283	0.517
Haddock	74	Ratio	0.972	0.252
Red Hake	77	Beta-binomial	3.959	0.460
Spotted Hake	78	Beta-binomial	3.839	0.500
American Plaice	102	Beta-binomial	2.074	0.188
Summer Flounder	103	Beta-binomial	3.226	0.320
Fourspot Flounder	104	Ratio	3.099	0.457
Yellowtail Flounder	105	Beta-binomial	2.347	0.356
Windowpane	108	Beta-binomial	3.311	0.388
Butterfish	131	Beta-binomial	1.487	0.220
Longhorn Sculpin	163	Beta-binomial	3.560	0.332
American Lobster	301	Beta-binomial	1.571	0.236
Atlantic Rock Crab	313	Beta-binomial	3.343	0.640
Sea Scallop	401	Beta-binomial	3.965	0.603
Longfin Squid	503	Beta-binomial	2.034	0.245

Table 55. For each species, the recommended type of estimator, resulting estimate, standard error and confidence intervals based on data collected at fall survey stations. These species were observed by both vessels at ≥ 30 stations in each of the spring and fall survey sets.

Species	SVSPP	Estimator	$\hat{\rho}$	$SE(\hat{\rho})$
Spiny Dogfish	15	Beta-binomial	1.204	0.099
Winter Skate	23	Ratio	2.609	0.324
Little Skate	26	Beta-binomial	9.846	1.022
Atlantic Herring	32	Beta-binomial	2.000	0.236
Silver Hake	72	Beta-binomial	4.354	0.285
Haddock	74	Beta-binomial	1.816	0.243
Red Hake	77	Beta-binomial	2.662	0.249
Spotted Hake	78	Ratio	2.319	0.261
American Plaice	102	Beta-binomial	2.160	0.164
Summer Flounder	103	Beta-binomial	2.405	0.263
Fourspot Flounder	104	Ratio	2.356	0.221
Yellowtail Flounder	105	Beta-binomial	2.366	0.207
Windowpane	108	Ratio	2.044	0.200
Butterfish	131	Beta-binomial	1.935	0.172
Longhorn Sculpin	163	Beta-binomial	3.114	0.304
American Lobster	301	Beta-binomial	1.586	0.179
Atlantic Rock Crab	313	Beta-binomial	2.511	0.408
Sea Scallop	401	Beta-binomial	3.166	0.358

Longfin Squid	503	Ratio	0.840	0.112

Table 56. Estimates and standard errors of the mean weight- and biomass-based calibration factors for either spring or fall surveys. These species were observed by both vessels at ≥ 30 total stations but <30 stations in either the fall or spring set of survey stations.

Species	SVSPP	$\hat{\rho}_w$	$SE(\hat{\rho}_w)$	$\hat{\rho}_W$	$SE(\hat{\rho}_W)$
Smooth Dogfish	13	0.932	0.092	1.082	0.177
Barndoor Skate	22	0.825	0.095	3.661	0.511
Clearnose Skate	24	0.925	0.039	6.189	0.813
Smooth Skate	27	1.015	0.108	4.450	0.668
Thorny Skate	28	0.956	0.123	3.626	0.576
Round Herring	31	1.143	0.043	1.403	0.273
Alewife	33	0.832	0.072	1.100	0.153
Blueback Herring	34	1.643	0.208	2.120	0.339
Atlantic Cod	73	0.795	0.059	1.580	0.191
White Hake	76	0.934	0.083	2.088	0.207
Winter Flounder	106	0.838	0.054	2.086	0.210
Witch Flounder	107	1.000	0.084	3.257	0.368
Gulf Stream Flounder	109	1.479	0.117	12.199	1.242
Atlantic Mackerel	121	0.731	0.037	0.868	0.140
Bluefish	135	0.573	0.102	0.665	0.165
Atlantic Croaker	136	0.993	0.073	1.125	0.217
Black Sea Bass	141	0.828	0.109	2.827	0.494
Scup	143	0.790	0.050	1.347	0.188
Weakfish	145	1.265	0.091	1.994	0.321
Spot	149	0.996	0.050	1.535	0.254
Acadian Redfish	155	0.818	0.041	1.191	0.127
Sea Raven	164	0.751	0.084	1.354	0.177
Northern Searobin	171	0.725	0.061	3.259	0.446
Northern Sand Lance	181	0.387	0.026	0.220	0.057
Ocean Pout	193	0.855	0.067	3.912	0.439
Goosefish	197	1.131	0.154	8.062	0.930
Northern Shortfin Squid	502	1.021	0.058	1.409	0.124
Spoonarm Octopus	512	0.899	0.073	2.075	0.379

Table 57. Estimates and standard errors of the mean weight- and biomass-based calibration factors based for spring survey stations. These species were observed by both vessels at $\geq$ 30 stations in each of the spring and fall survey sets.

Species	SVSPP	$\hat{\rho}_w$	$SE(\hat{\rho}_w)$	$\hat{\rho}_W$	$SE(\hat{\rho}_W)$
Spiny Dogfish	15	0.970	0.044	1.166	0.090
Winter Skate	23	0.973	0.063	3.718	0.583

Little Skate	26	0.904	0.035	2.786	0.318
Atlantic Herring	32	2.359	0.388	5.394	0.769
Silver Hake	72	0.731	0.083	4.591	0.486
Haddock	74	0.904	0.062	0.878	0.247
Red Hake	77	0.938	0.091	3.712	0.479
Spotted Hake	78	0.907	0.138	3.483	0.543
American Plaice	102	1.008	0.099	2.092	0.235
Summer Flounder	103	0.950	0.100	3.066	0.358
Fourspot Flounder	104	0.984	0.051	3.050	0.462
Yellowtail Flounder	105	0.956	0.034	2.244	0.351
Windowpane	108	0.927	0.133	3.069	0.441
Butterfish	131	1.584	0.153	2.356	0.332
Longhorn Sculpin	163	0.839	0.050	2.986	0.319
American Lobster	301	0.810	0.076	1.272	0.232
Atlantic Rock Crab	313	1.156	0.232	3.864	0.794
Sea Scallop	401	0.467	0.043	1.850	0.420
Longfin Squid	503	1.406	0.148	2.861	0.358

Table 58. Estimates and standard errors of the mean weight- and biomass-based calibration factors for fall survey stations. These species were observed by both vessels at ≥ 30 stations in each of the spring and fall survey sets.

Species	SVSPP	$\hat{\rho}_w$	$SE(\hat{\rho}_w)$	$\hat{\rho}_W$	$SE(\hat{\rho}_W)$
Spiny Dogfish	15	1.005	0.077	1.210	0.130
Winter Skate	23	0.833	0.068	2.174	0.314
Little Skate	26	0.895	0.052	8.814	0.979
Atlantic Herring	32	0.975	0.031	1.950	0.237
Silver Hake	72	0.999	0.068	4.349	0.317
Haddock	74	0.820	0.084	1.489	0.247
Red Hake	77	1.127	0.094	3.000	0.305
Spotted Hake	78	1.037	0.049	2.405	0.276
American Plaice	102	0.784	0.082	1.692	0.187
Summer Flounder	103	0.890	0.098	2.141	0.290
Fourspot Flounder	104	0.913	0.055	2.151	0.227
Yellowtail Flounder	105	1.015	0.046	2.402	0.220
Windowpane	108	0.930	0.056	1.901	0.209
Butterfish	131	0.934	0.057	1.808	0.184
Longhorn Sculpin	163	0.890	0.057	2.771	0.304
American Lobster	301	0.867	0.087	1.375	0.198
Atlantic Rock Crab	313	0.987	0.132	2.479	0.453
Sea Scallop	401	0.995	0.060	3.151	0.372
Longfin Squid	503	1.412	0.104	1.186	0.163

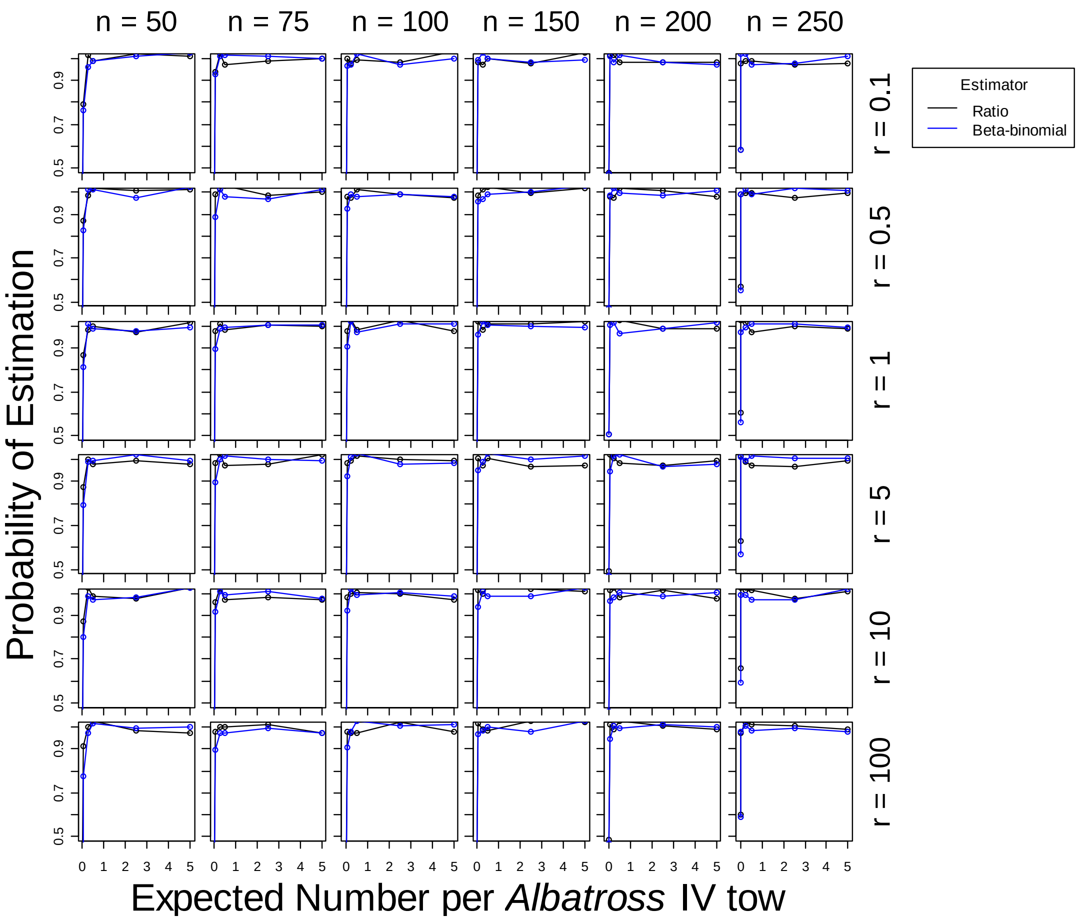

Figure 1. Relationship of probability of estimation to expected catch, number of stations, and negative binomial dispersion parameter *r* for each of the calibration factor estimators when tow data at each station have joint negative multinomial distribution. Values have been jittered to allow better visibility.

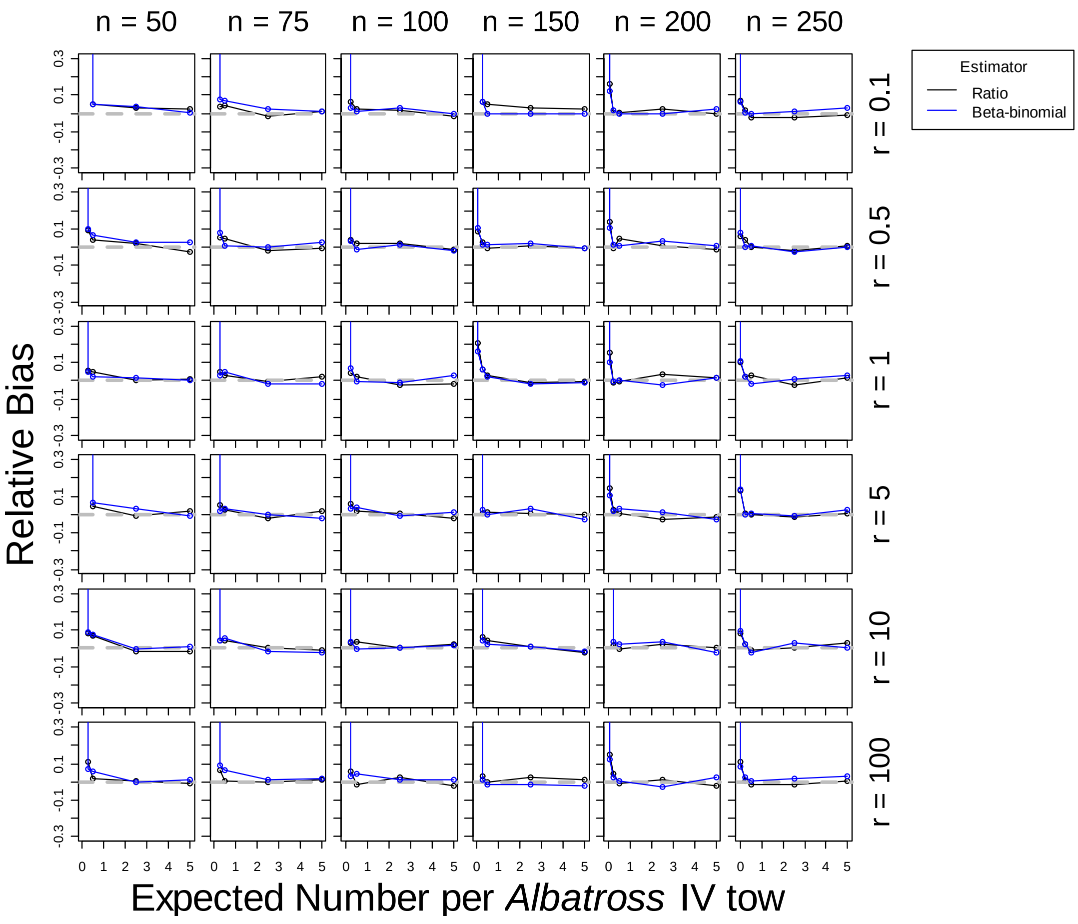

Figure 2. Relationship of relative bias to expected catch, number of stations, and negative binomial dispersion parameter r for each of the calibration factor estimators when tow data at each station have joint negative multinomial distribution. Values have been jittered to allow better visibility.

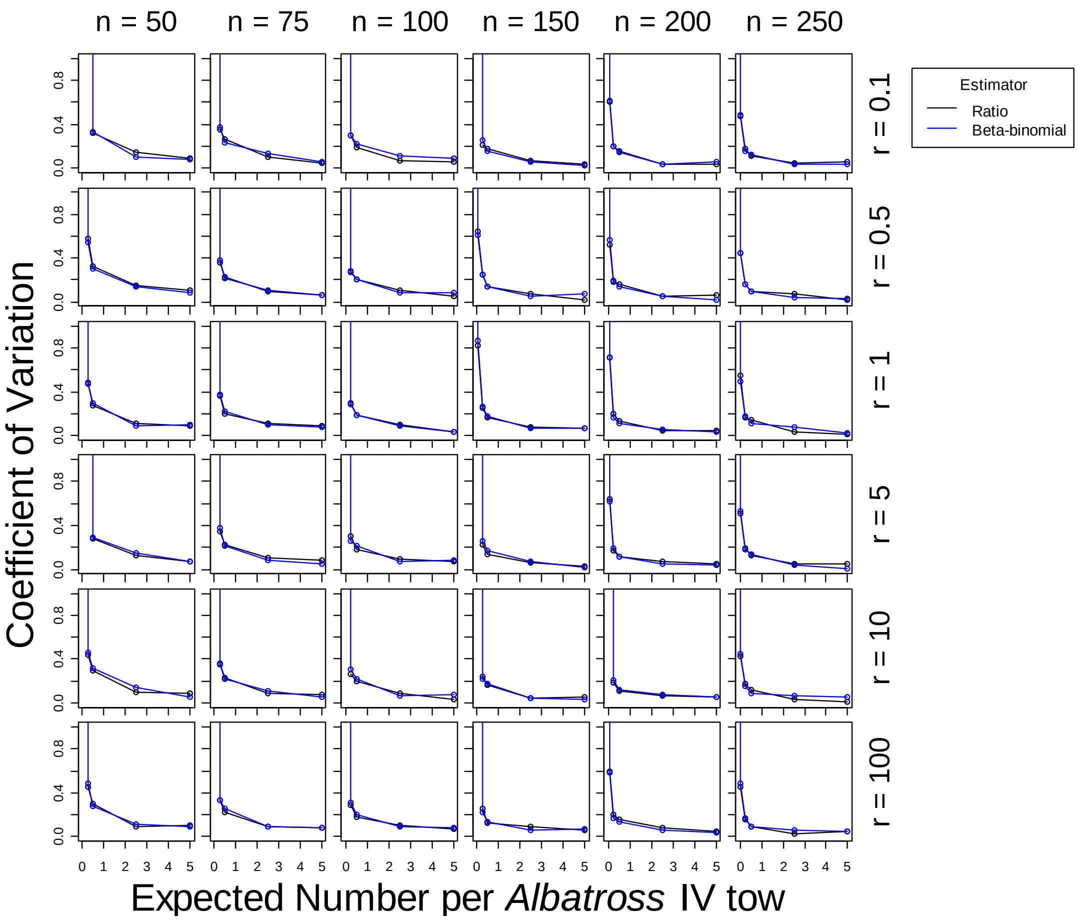

Figure 3. Relationship of coefficient of variation to expected catch, number of stations, and negative binomial dispersion parameter r for each of the calibration factor estimators when tow data at each station have joint negative multinomial distribution. Values have been jittered to allow better visibility.

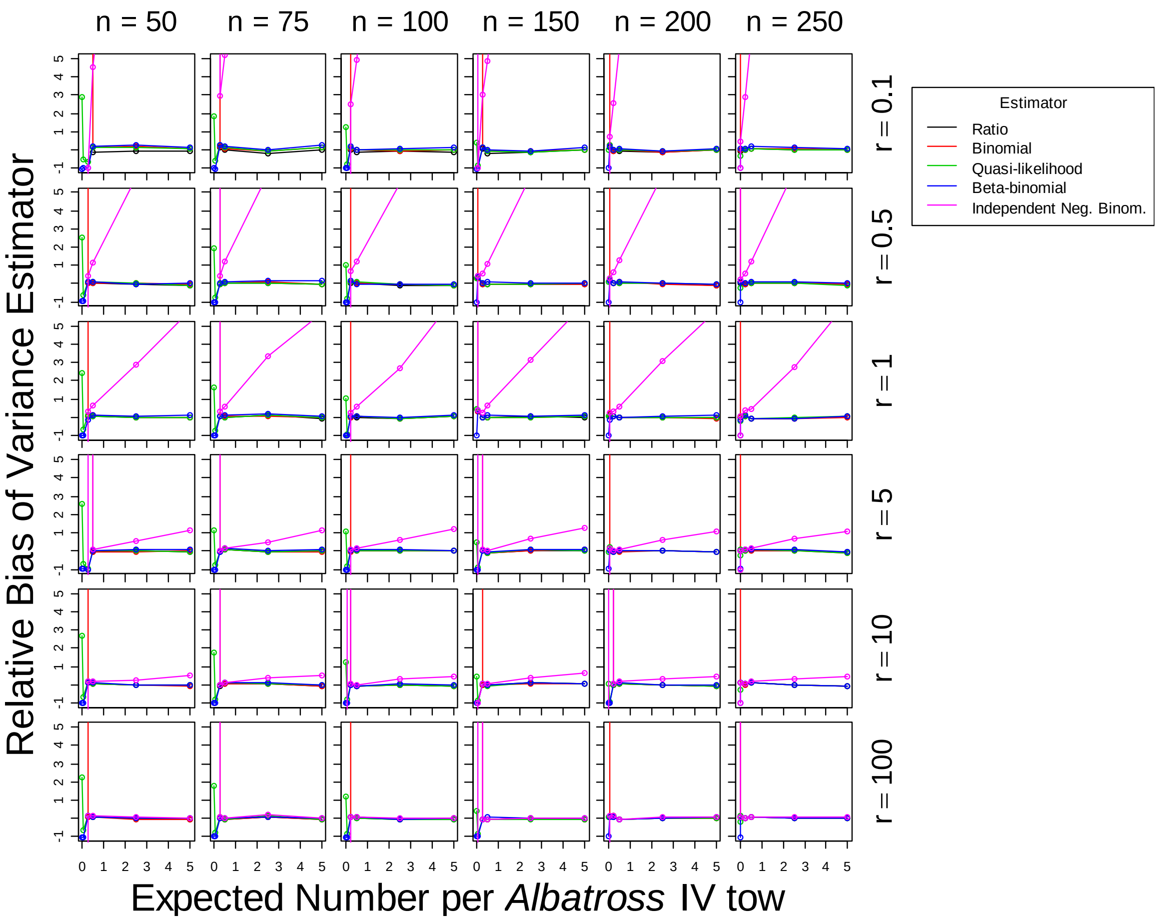

Figure 4. Relationship of relative bias of the variance estimator to expected catch, number of stations, and negative binomial dispersion parameter r for each of the calibration factor estimators when tow data at each station have joint negative multinomial distribution. Values have been jittered to allow better visibility.

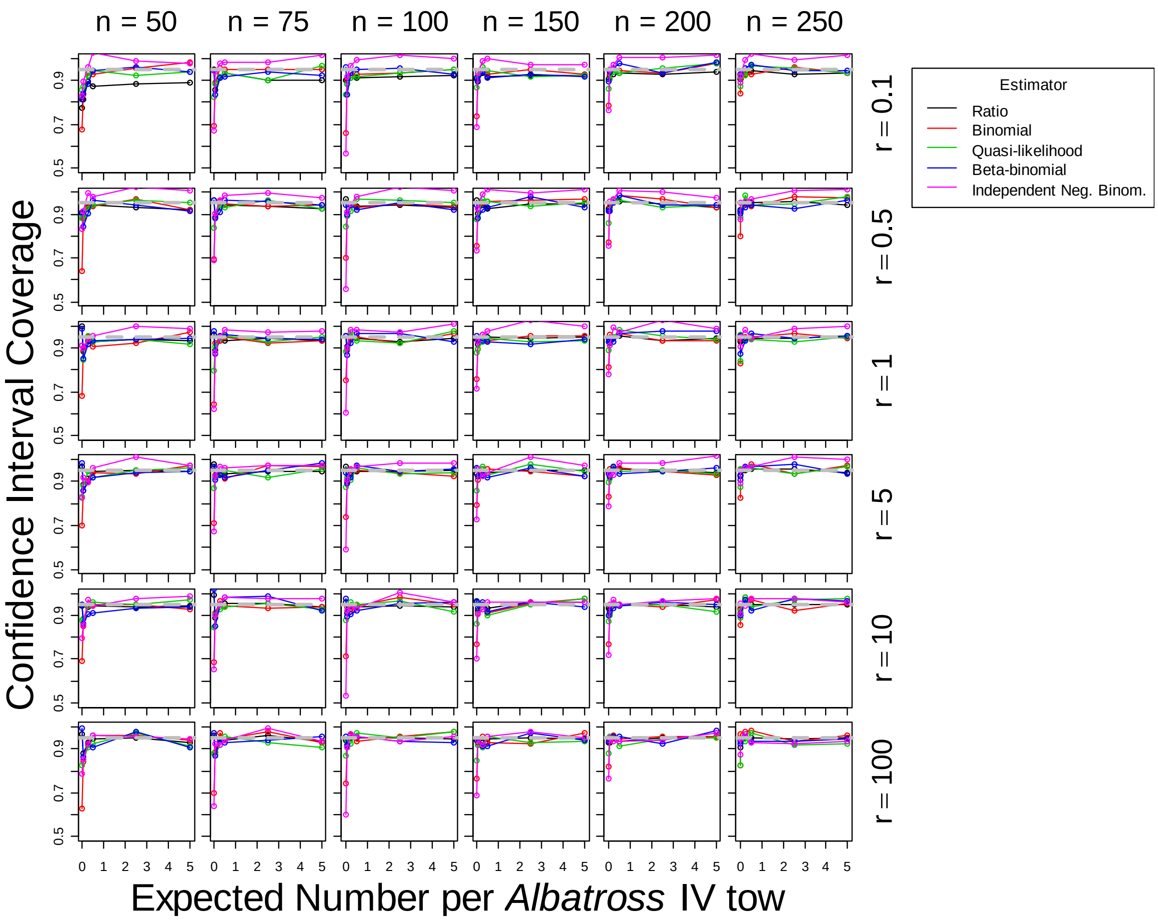

Figure 5. Relationship of 95% confidence interval coverage to expected catch, number of stations, and negative binomial dispersion parameter r for each of the calibration factor estimators when tow data at each station have joint negative multinomial distribution. Values have been jittered to allow better visibility.

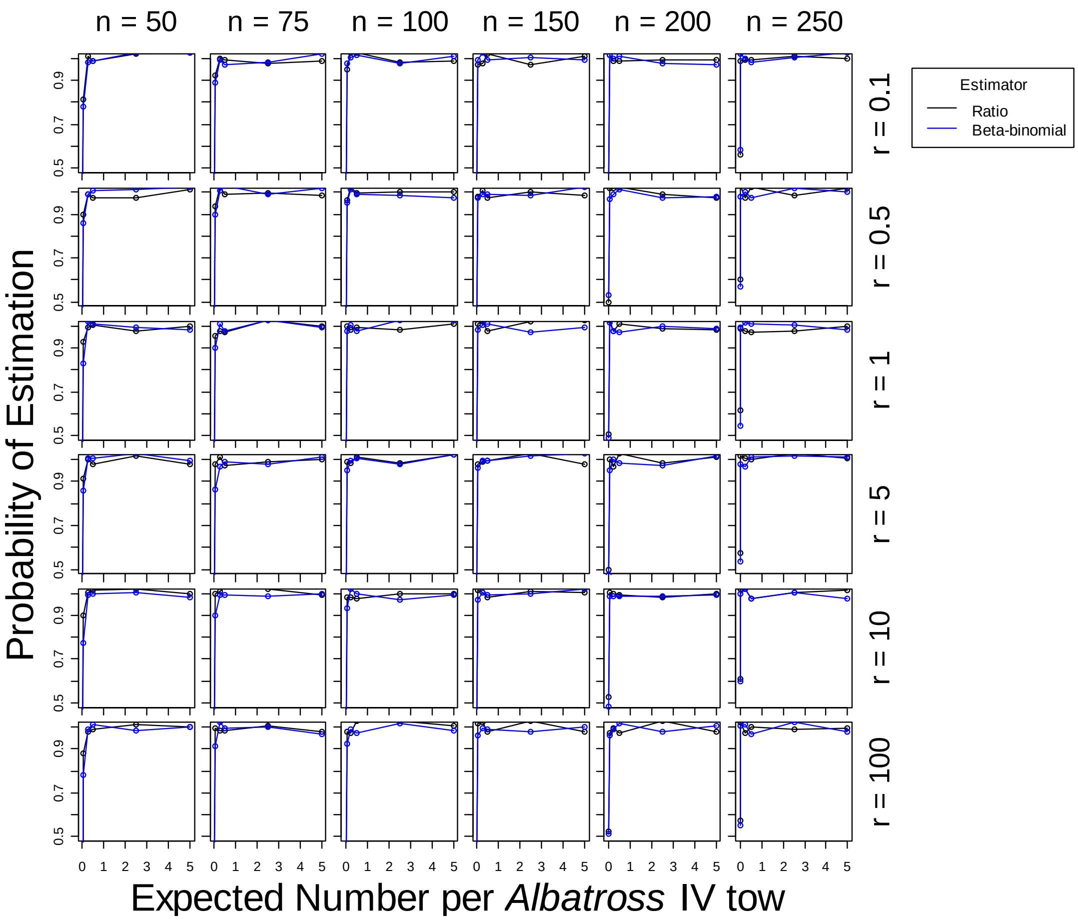

Figure 6. Relationship of probability of estimation to expected catch, number of stations, and negative binomial dispersion parameter r for each of the calibration factor estimators when tow data at each station have independent negative binomial distributions. Values have been jittered to allow better visibility.

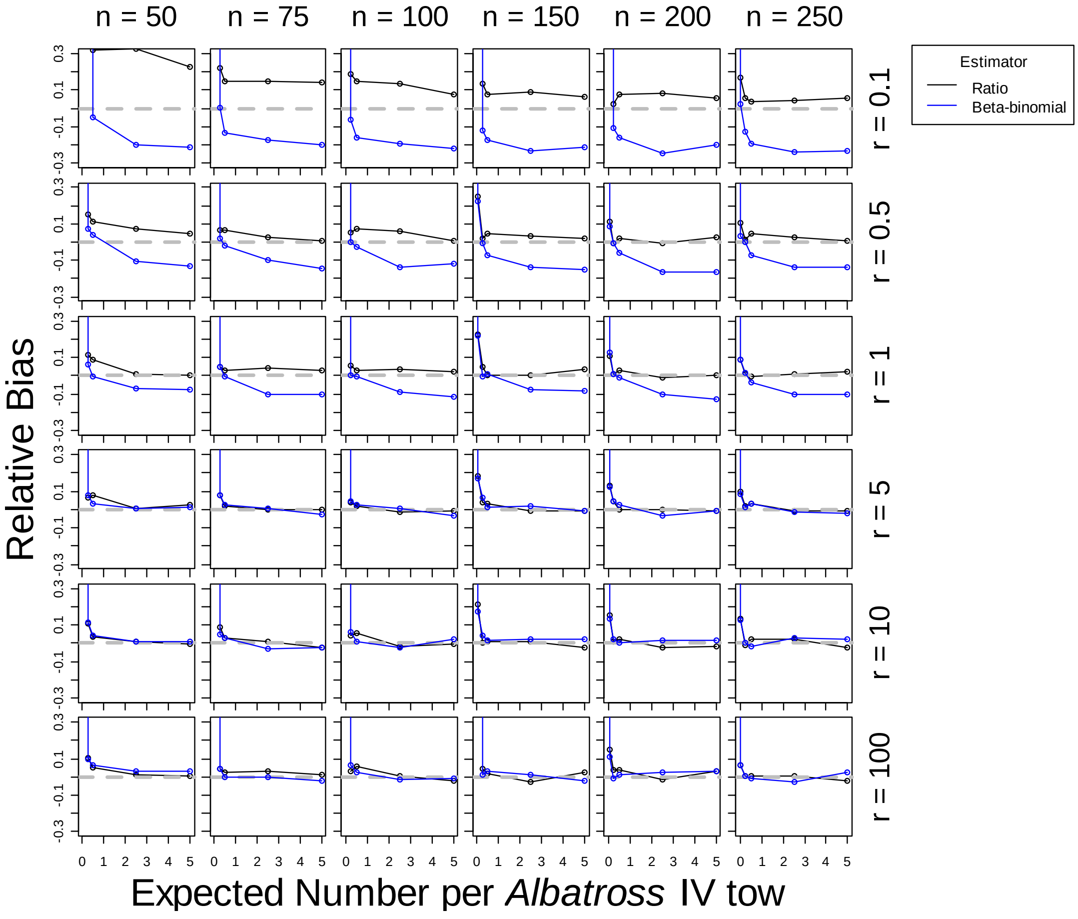

Figure 7. Relationship of relative bias to expected catch, number of stations, and negative binomial dispersion parameter r for each of the calibration factor estimators when tow data at each station have independent negative binomial distributions. Values have been jittered to allow better visibility.

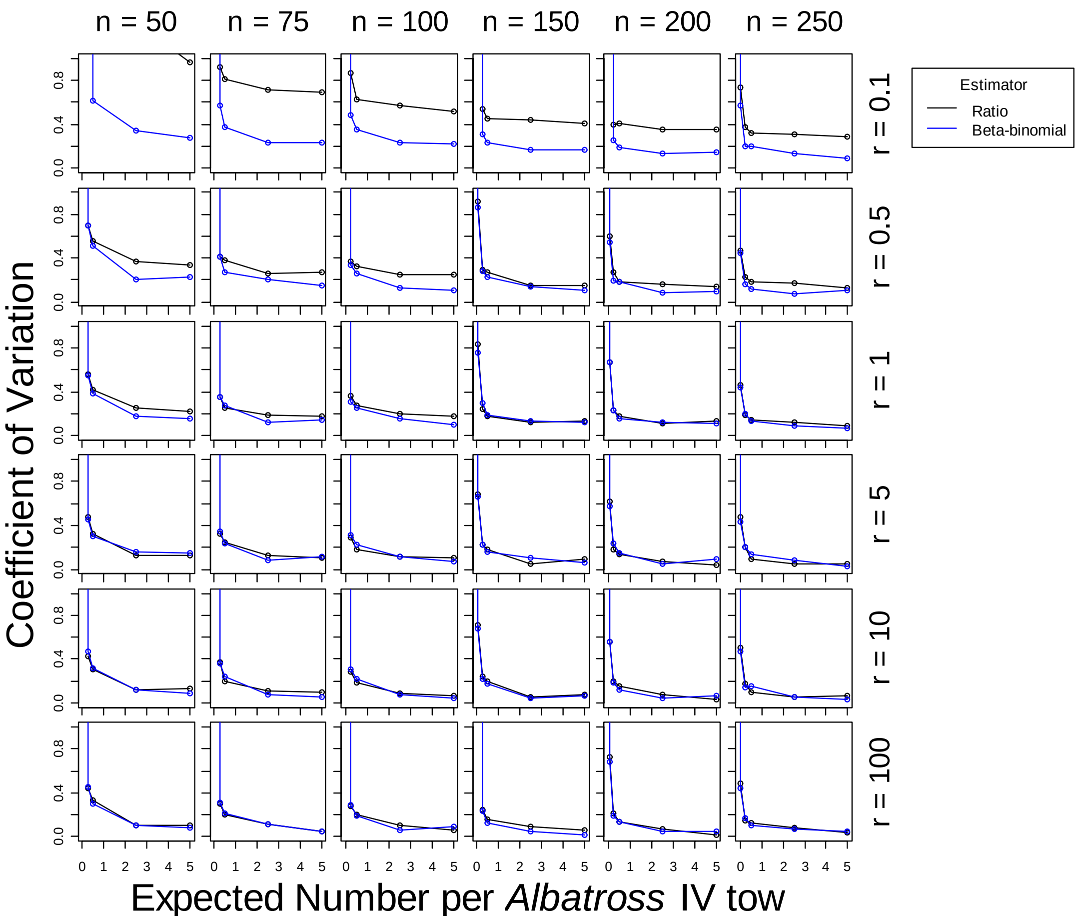

Figure 8. Relationship of coefficient of variation to expected catch, number of stations, and negative binomial dispersion parameter r for each of the calibration factor estimators when tow data at each station have independent negative binomial distributions. Values have been jittered to allow better visibility.

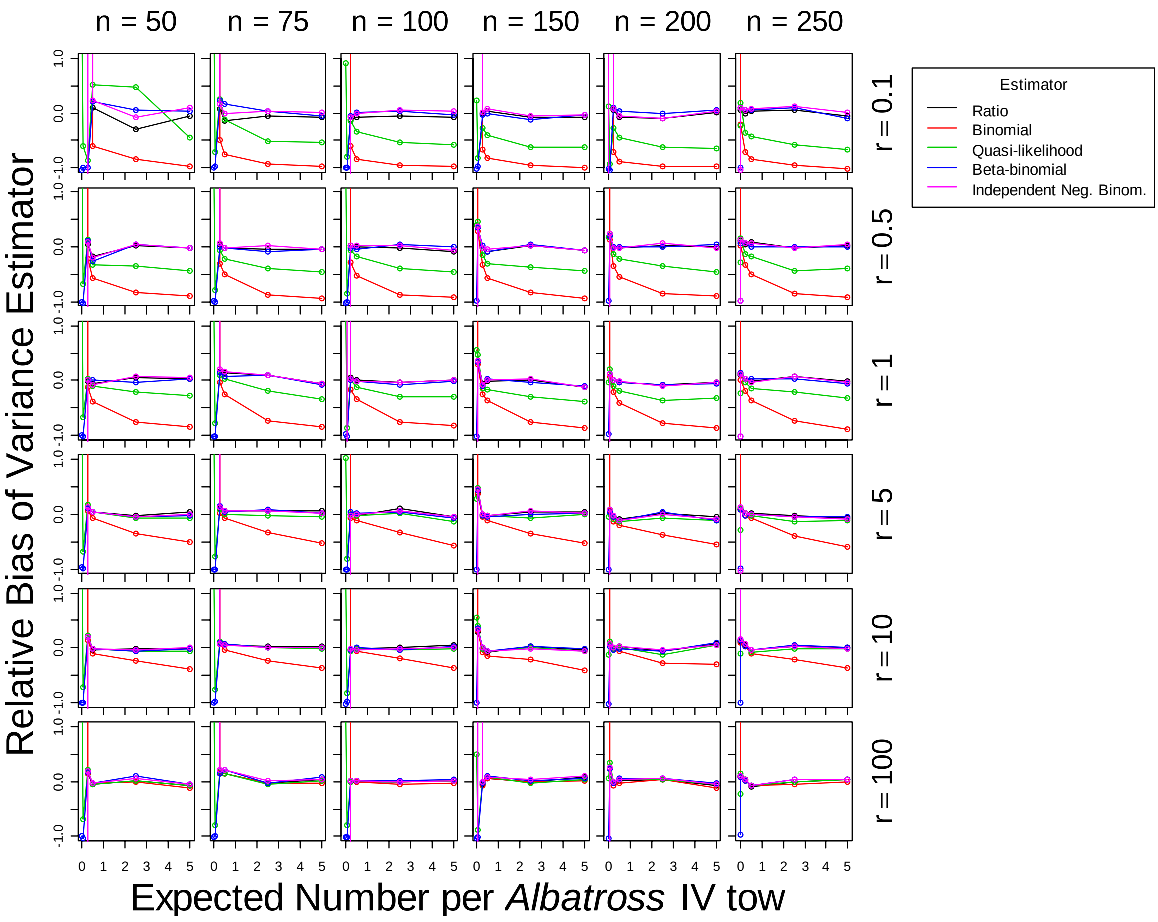

Figure 9. Relationship of relative bias of the variance estimator to expected catch, number of stations, and negative binomial dispersion parameter r for each of the calibration factor estimators when tow data at each station have independent negative binomial distributions. Values have been jittered to allow better visibility.

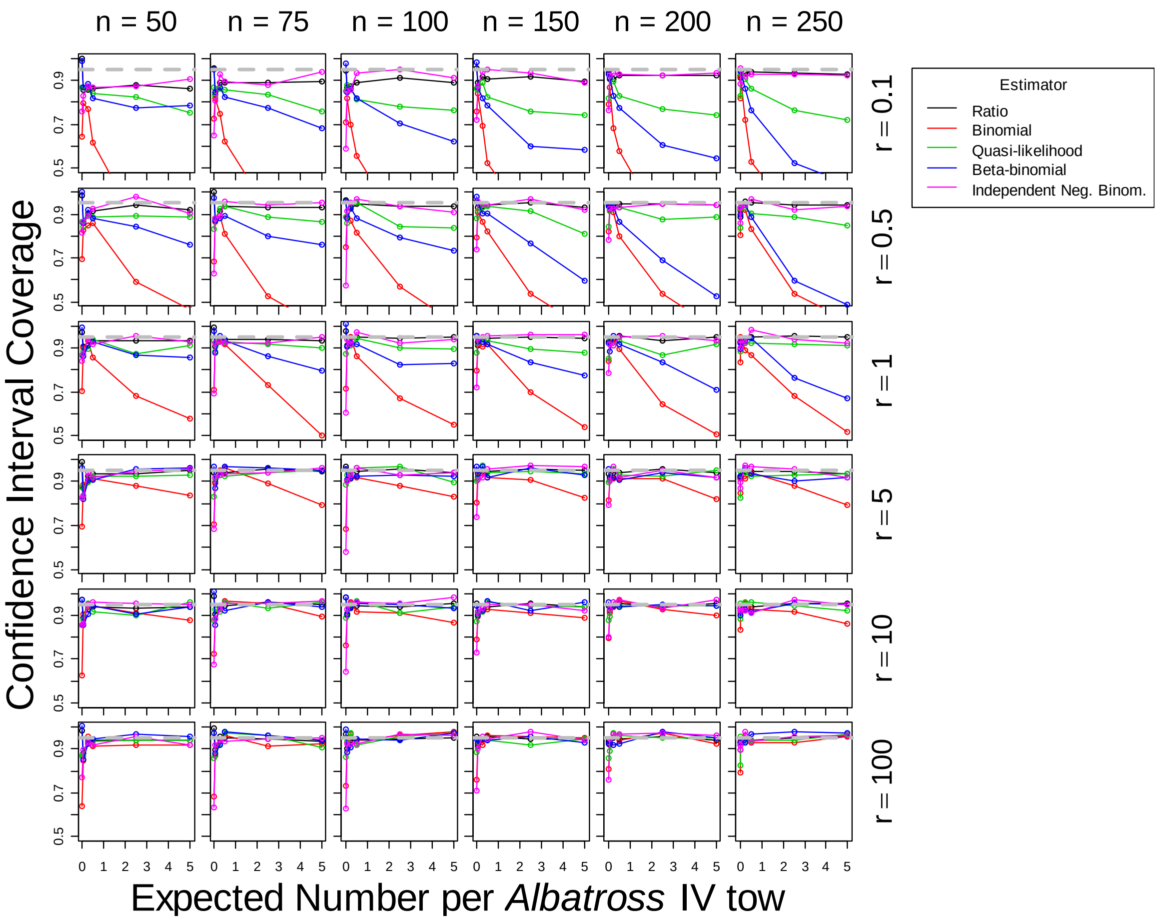

Figure 10. Relationship of 95% confidence interval coverage to expected catch, number of stations, and negative binomial dispersion parameter r for each of the calibration factor estimators when tow data at each station have independent negative binomial distributions. Values have been jittered to allow better visibility.

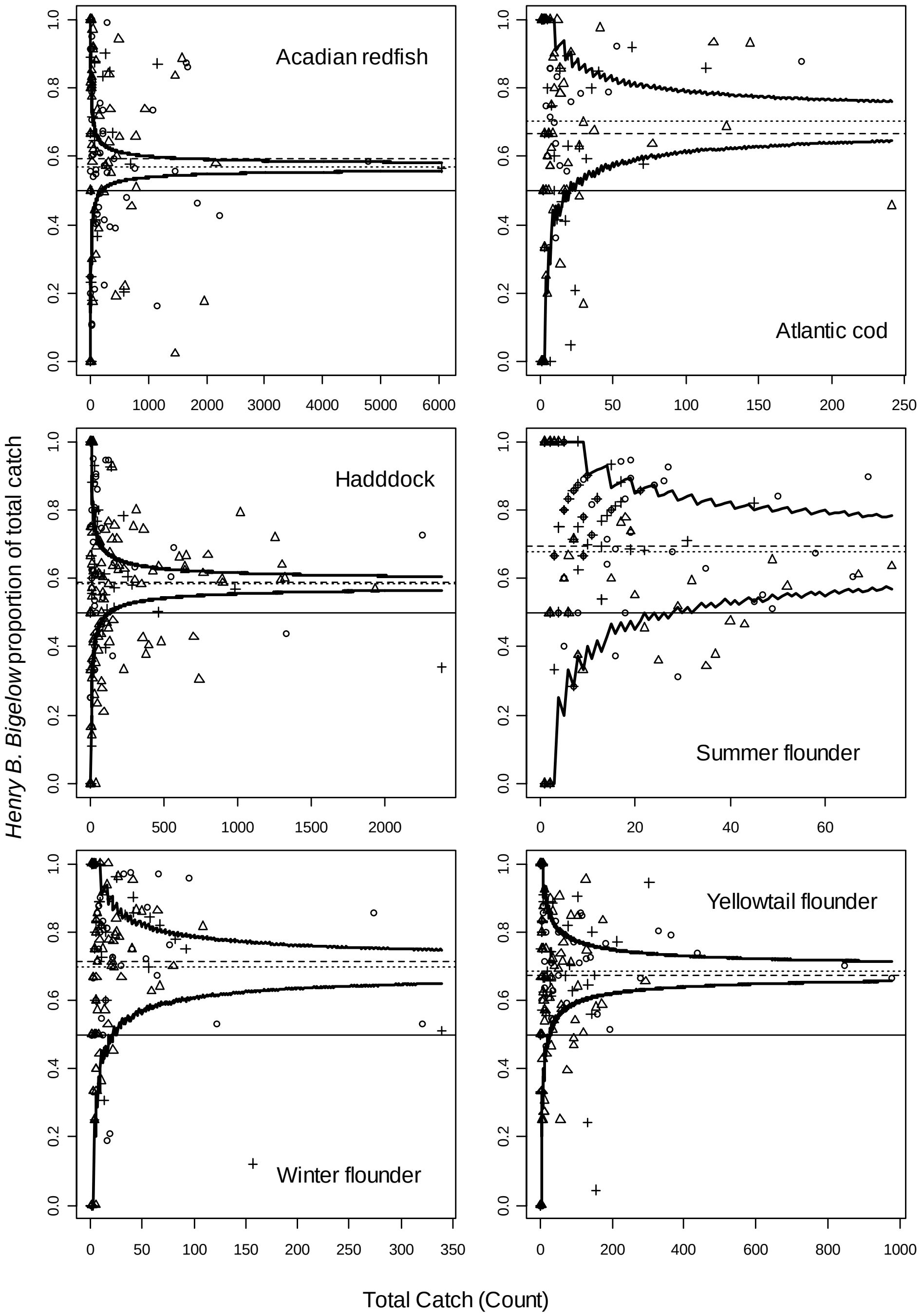

Figure 11. Proportion of total catch at each station caught by the Henry B. Bigelow for spring (+), fall (open circle), and site-specific (triangle) stations. The beta-binomial MLE and ratio estimate of the expected proportion caught by the Henry B. Bigelow are represented by the dashed and dotted lines where as the line of equivalent capture by the Henry B. Bigelow and Albatross IV (p = 0.5) is given by the solid line. Bold lines represent the 0.95 probability range of proportions under a binomial model with probability equal to that estimated by the ratio-type estimator and n given by the total catch at the station.