



Model-Averaged Confidence Distribution

David Fletcher¹, Peter Dillingham¹, Jiaxu Zeng²

1. Department of Mathematics and Statistics, University of Otago, Dunedin
2. Department of Preventive and Social Medicine, University of Otago, Dunedin

Confidence Distributions

- In the frequentist setting, parameter estimation is usually summarised by a point estimate and confidence interval.
- An alternative is a confidence distribution, which provides a visual summary of all possible confidence intervals [1].
- For example, suppose that we have a random sample x_1, x_2, \dots, x_n from a normal distribution with mean μ and σ^2 . A confidence distribution for μ is given by

$$H_{\Phi}(\mu) = \Phi\left(\frac{\mu - \bar{x}}{\sigma/\sqrt{n}}\right)$$

where \bar{x} is the sample mean and Φ is the c.d.f of the $N(0,1)$ distribution.

Aim

- When we have several plausible models, model averaging is an attractive alternative to model selection, as inference is based on the full set of models rather than a single best model [2].
- We propose summarising the results obtained from model averaging, via a model-averaged version of a confidence distribution.
- We illustrate use of this approach by an analysis of data obtained from a study of the density of a seaweed.

Data

- Data were collected on the density of *Ecklonia radiata* on the west coast of Te Wai Pounamu, the South Island of New Zealand.
- We are interested here in comparing the mean densities in three zones, which differed in their distance from the ocean.
- A total of 32, 25 and 45 quadrats were collected in zone 1 to 3 respectively.

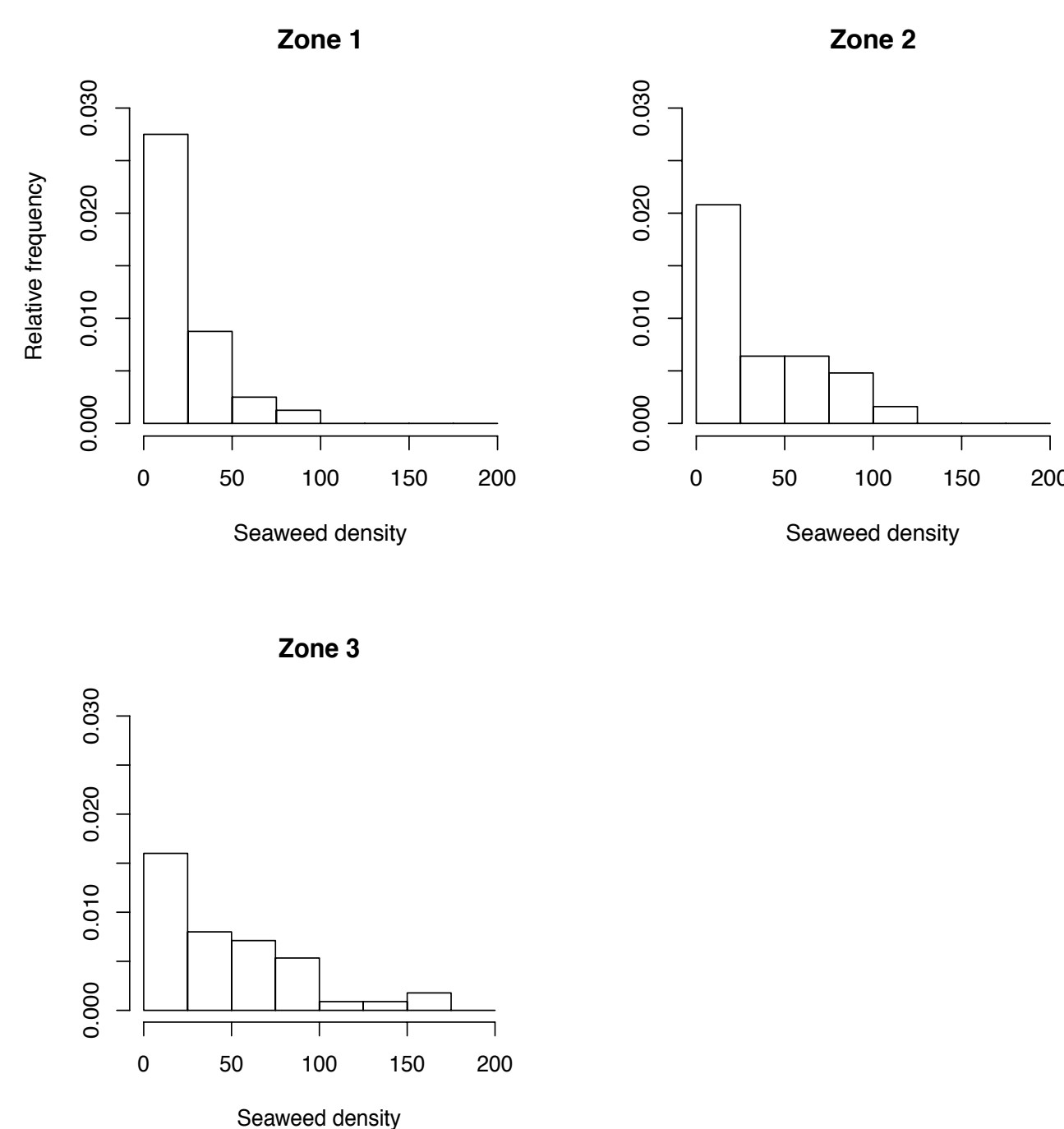


Figure 1: Relative frequencies of observed *Ecklonia* densities in each zone.

Negative Binomial Models

- Model 1: No effect of zone on mean density
- Model 2: Different mean density in each zone.
- A confidence distribution can be drawn for each model
- A model-averaged confidence distribution can be obtained using AIC model weights and the MATA method for model-averaged confidence intervals [3].

Results

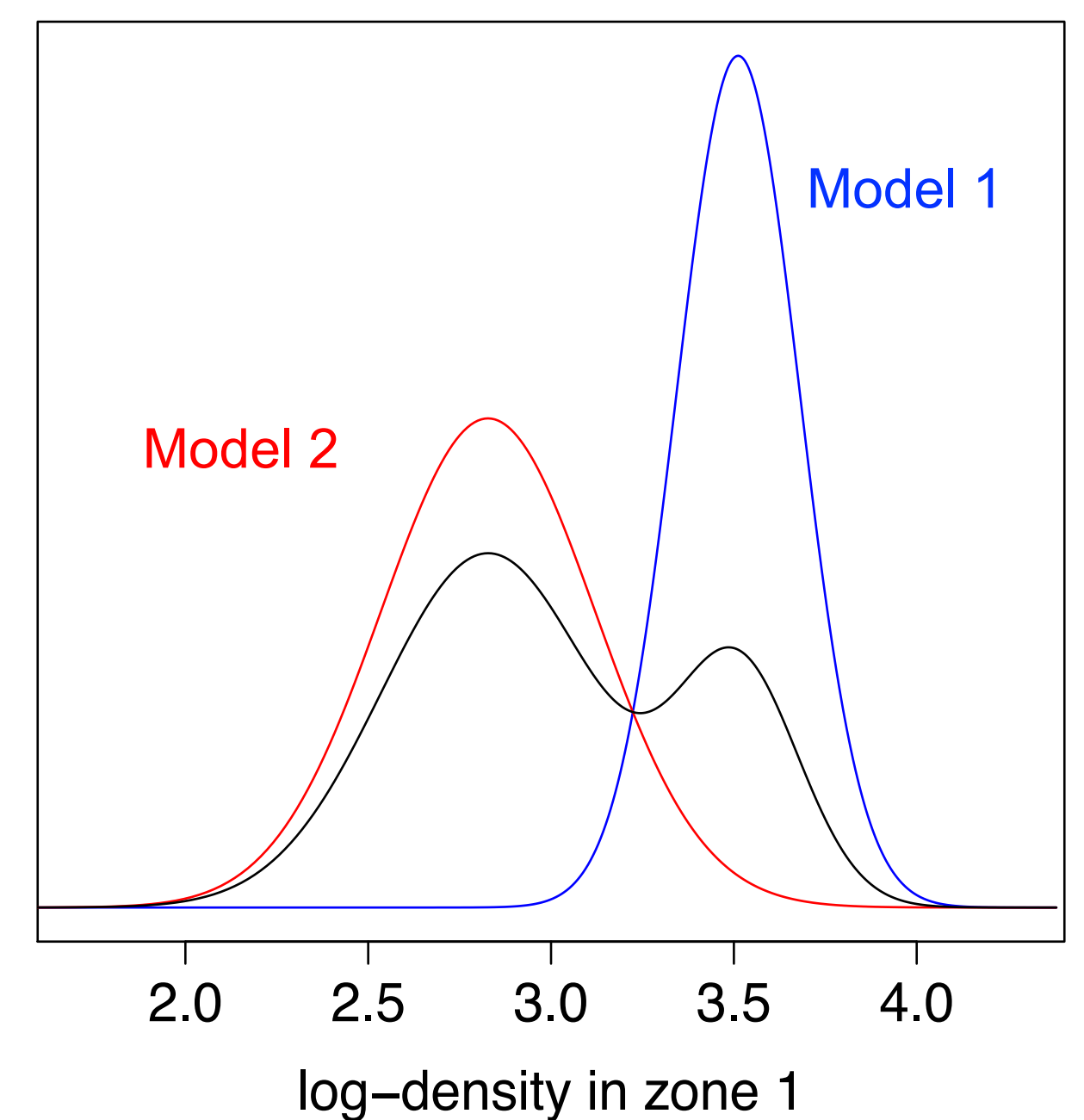


Figure 2: Model-Averaged confidence distribution for the logarithm of mean density in zone 1. AIC weights for models 1 and 2 are 0.28 and 0.72, respectively.

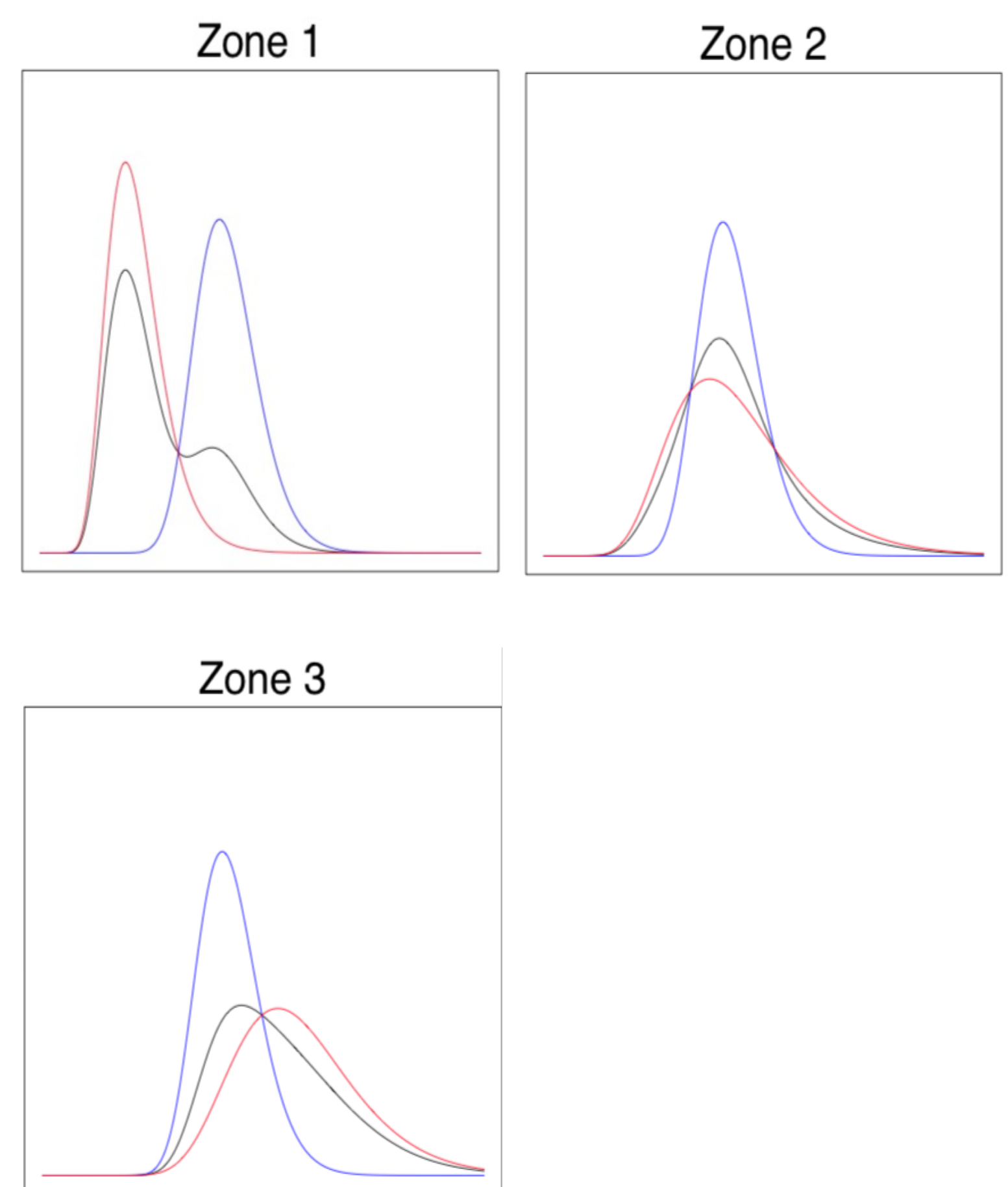


Figure 3: Model-Averaged confidence distribution for mean density in each zone.

References

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