# SUPPLEMENTARY TABLES

**Table S1.** List of the 11 species selected to determine the importance of mangroves as nursery species and description of their economic importance, conservation status, length at first maturity and bibliography sources.

| Species name | Family | Common name | Economic importance | Conservation status | Length at first maturity (cm) | Literature source |
|---|---|---|---|---|---|---|
| *Abudefduf troschelii* | Pomacentridae | Pacific seargent major | Aquarium commercial | Least concern | 12.9 | Froese & Pauly 2000; Jones et al. 2010 |
| *Chaetodon humeralis* | Chaetodontidae | Threebanded butterfly fish | Aquarium commercial | Least concern | 15.9 | Nagelkerken et al. 2010; Tirado et al.2018 |
| *Eucinostomus dowii* | Gerreidae | Dow's mojarra | Unknown | Least concern | 17 | Rooker 1991, Jimenez 1998 |
| *Halichoeres dispilus* | Labridae | Chameleon wrasse | Aquarium commercial | Least concern | 9.1 | Aaron 2006, Mellin 2007 |
| *Holacanthus passer* | Pomacanthidae | King angelfish | Aquarium commercial | Least concern | 21.8 | Fernandez Rivera 2016 |
| *Lutjanus argentiventris* | Lutjanidae | Yellow snapper | Commercial fishing, aquaculture | Least concern | 19 | Nagelkerken et al. 2010; Gillander 2003; Froese & Pauly 2000; |
| *Mugil spp.* | Mugilidae | Mullets | Commercial fishing, aquaculture | Least concern | 35.4 | Froese & Pauly 2000, Gillander 2003 |
| *Mycteroperca olfax* | Serranidae | Sailfin grouper | Commercial fishing, aquaculture | Vulnerable | 65.3 | Nagelkerken et al.2010, Froese & Pauly 2000 |
| *Scarus ghobban* | Scaridae | Blue-barred parrotfish | Commercial fishing, aquaculture | Least concern | 49 | Jones et al 2010 /Nagelkerken et al.2001, Froese & Pauly 2000 |
| *Sphoeroides annulatus* | Tetraodontidae | Bullseye puffer | Aquarium commercial | Least concern | 25.9 | Tirado et al. 2018 |
| *Stegastes arcifrons* | Pomacentridae | Island major | Aquarium commercial | Least concern | 5.5 | Nagelkerken 2002, Allen et al 1980 |

**Table S2.** No. of species and juvenile abundance percentages (%) out of the total abundance of all reef fish species observed in UVC surveys across 58 sites in the GMR, detailed by habitat and bioregion.

| | Habitat | | | Bioregion | | |
|---|---|---|---|---|---|---|
| | Mangroves | Shallow-rocky reef | Both | Central-eastern | Western | Both |
| **No. of species** | 19 | 16 | 40 | 29 | 4 | 42 |
| **Juvenile abundance percentage %** | 3.16 | 2.34 | 94.59 | 26.36 | 0.04 | 73.60 |
| **Representative species** | *Caranx caballus* *Lutjanus jordani* | *Odontoscion eurymrsops* | *Mycteroperca olfax* *Lutjanus argentiventris* | *Apogon atradorsatus* *Abudefduf trsochelii* | *Trachinotus stilbe* | *Lutjanus argentiventris* *Scarus ghobban* |

**Table S3.** Estimated regression parameters, standard errors, z-values, P-values and AIC of the juvenile reef fish species obtained by the Poisson GLMM and Negative Binomial GLM

| Species name | GLM model | Estimates | SE | Z-value | p-value | AIC | Over-dispersion |
|---|---|---|---|---|---|---|---|
| *Abudefdul troschelli* | **NB** | | | | | | |
| | Intercept | 2.673 | 0.236 | 11.324 | $2 \times 10^{-16}$ | | |
| | Habitat: Shallow-rocky-reef | -0.188 | 0.325 | 0.579 | 0.563 | | |
| | Bioregion: Western | 0.022 | 0.460 | 0.047 | 0.962 | 1412.3 | 0.70 |
| *Chaetodon humeralis* | **Poisson** | | | | | | |
| | Intercept | -3.120 | 0.602 | -5.175 | $2.2 \times 10^{-7}$ | | |
| | Habitat: Shallow rocky reef | 0.505 | 0.851 | 0.594 | 0.553 | | |
| | Bioregion: Western | -1.661 | 1.075 | -1.545 | 0.12 | 298.0 | 0.82 |
| | **NB** | | | | | | |
| | Intercept | -2.560 | 0.682 | -3.754 | 0.000174 | | |
| | Habitat: Shallow-rocky reef | 0.601 | 0.850 | 0.711 | 0.476 | | |
| | Bioregion: Western | -1.690 | 1.070 | -1.575 | 0.115 | 226.2 | 0.41 |
| *Eucinostomus dowii* | **ZIP-NB** | | | | | | |
| | Intercept | 0.667 | 0.431 | 1.549 | 0.121 | | |
| | Habitat Shallow-rocky reef | -2.747 | 0.892 | -3.079 | 0.002* | | |
| | Bioregion Western | -1.497 | 0.710 | -2.118 | 0.003* | 521.0 | 0.634 |
| *Halichoeres dispilus* | **NB** | | | | | | |
| | Intercept | -4.124 | 1.630 | -2.530 | 0.011 | | |
| | Habitat Shallow-rocky reef | 3.624 | 1.481 | 2.447 | 0.014* | | |
| | Bioregion Western | -1.848 | 2.298 | -0.804 | 0.421 | 232.2 | 0.20 |
| *Halocanthus passer* | **Poisson** | | | | | | |
| | Intercept | -6.587 | 1.834 | -3.592 | 0.0003 | | |
| | Habitat Shallow-rocky reef | 2.603 | 1.516 | 1.717 | 0.086 | | |
| | Bioregion Western | -1.749 | 2.024 | -0.864 | 0.387 | 147.4 | 0.30 |
| | **NB** | | | | | | |
| | Intercept | -6.742 | 2.101 | -3.210 | 0.001 | | |
| | Habitat Shallow-rocky reef | 2.683 | 1.644 | 1.633 | 0.102 | | |
| | Bioregion Western | -1.811 | 2.148 | -0.843 | 0.400 | 127.8 | 0.12 |
| *Lutjanus argentiventris* | **NB** | | | | | | |
| | Intercept | 1.314 | 0.281 | 4.670 | $3.01 \times 10^{-6}$ | | |
| | Habitat Shallow-rocky reef | -4.601 | 1.090 | -4.215 | $2.5 \times 10^{-5}$* | | |
| | Bioregion Western | -0.158 | 0.511 | -0.310 | 0.756 | 858.90 | 1.03 |
| *Lutjanus novemfsciatus* | **Poisson** | | | | | | |
| | Intercept | -1.593 | 0.796 | -2.000 | 0.046 | | |
| | Habitat Shallow-rocky reef | NA | NA | NA | NA | | |
| | Bioregion Western | -2.123 | 0.999 | -2.125 | 0.034* | 911.5 | 2.20 |
| | **NB** | | | | | | |
| | Intercept | -1.414 | 0.816 | -1.732 | 0.083 | | |
| | Habitat Shallow-rocky reef | NA | NA | NA | NA | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Mugil sp* | Bioregion Western | -2.116 | 0.995 | -2.124 | 0.034* | 627.9 | 0.41 |
| | **NB** | | | | | | |
| | Intercept | 1.590 | 0.799 | 1.992 | 0.046 | | |
| | Habitat Shallow-rocky reef | -2.383 | 1.223 | -1.940 | 0.052* | | |
| | Bioregion Western | -0.370 | 1.333 | -0.278 | 0.781 | 580.1 | 0.24 |
| *Mycteroperca olfax* | **Poisson** | | | | | | |
| | Intercept | -2.566 | 0.475 | -5.400 | $6.65 \times 10^{-8}$ | | |
| | Habitat Shallow-rocky reef | -1.424 | 0.699 | -2.037 | 0.042* | | |
| | Bioregion Western | 3.502 | 0.636 | 5.510 | $3.59 \times 10^{-8}$* | 432.1 | 0.65 |
| | **NB** | | | | | | |
| | Intercept | -2.526 | 0.477 | -5.293 | $1.20 \times 10^{-7}$ | | |
| | Habitat Shallow-rocky reef | -1.430 | 0.700 | -2.043 | 0.041* | | |
| | Bioregion Western | 3.506 | 0.637 | 5.502 | $3.75 \times 10^{-8}$* | 421.9 | 0.47 |
| *Scarus ghobban* | **NB** | | | | | | |
| | Intercept | -1.227 | 0.656 | -1.869 | 0.061 | | |
| | Habitat Shallow-rocky reef | -1.206 | 0.692 | -1.742 | 0.081* | | |
| | Bioregion Western | 2.860 | 0.912 | 3.137 | 0.002* | 378.3 | 0.552 |
| *Spheroides annulatus* | **NB** | | | | | | |
| | Intercept | 1.274 | 0.371 | 3.432 | 0.001 | | |
| | Habitat Shallow-rocky reef | -2.311 | 0.742 | -3.111 | 0.002* | | |
| | Bioregion Western | -1.581 | 0.705 | -2.244 | 0.025* | 1030.5 | 0.52 |
| *Stegastes arcifrons* | **NB** | | | | | | |
| | Intercept | 0.468 | 0.406 | 1.152 | 0.249 | | |
| | Habitat Shallow-rocky reef | -2.269 | 0.799 | -2.840 | 0.005* | | |
| | Bioregion Western | 0.460 | 0.708 | 0.649 | 0.516 | 853.6 | 0.44 |

**Table S4.** Estimated predicted values, standard error, upper and lower confidence interval of the juvenile species analyzed in the Poisson GLMM and Negative Binomial models

| Species name | Covariate | Estimated predicted values | SE | Upper CI | Lower CI |
|---|---|---|---|---|---|
| *Abudefduf troschelli* | **NB GLM** | | | | |
| | Mangrove CE | 14.49 | 0.24 | 23.01 | 9.12 |
| | Shallow rocky reef CE | 12.01 | 0.34 | 23.52 | 6.13 |
| | Mangrove W | 14.81 | 0.44 | 35.09 | 6.25 |
| | Shallow rocky reef W | 12.27 | 0.44 | 28.90 | 5.20 |
| *Cheatedon humaralis* | **NB GLM** | | | | |
| | Mangrove CE | 0.07 | 0.68 | 0.29 | 0.02 |
| | Shallow rocky reef CE | 0.14 | 0.95 | 0.90 | 0.02 |
| | Mangrove W | 0.01 | 1.28 | 0.18 | 0.00 |
| | Shallow rocky reef W | 0.03 | 1.33 | 0.35 | 0.00 |
| *Cheatedon humaralis* | **Poisson GLM** | | | | |
| | Mangrove CE | 0.04 | 0.60 | 0.14 | 0.01 |
| | Shallow rocky reef CE | 0.07 | 0.85 | 0.39 | 0.01 |
| | Mangrove W | 0.00 | 1.21 | 0.09 | 0.01 |
| | Shallow rocky reef W | 0.01 | 1.23 | 0.15 | 0.01 |
| *Eucinostomus dowii* | **NB GLM** | | | | |
| | Mangrove CE | 1.87 | 0.52 | 5.20 | 0.67 |
| | Shallow rocky reef CE | 0.09 | 1.09 | 0.79 | 0.01 |
| | Mangrove W | 0.16 | 0.87 | 0.86 | 0.03 |
| | Shallow rocky reef W | 0.01 | 1.36 | 0.11 | 0.00 |
| *Halichoeres dispilus* | **NB GLM** | | | | |
| | Mangrove CE | 0.02 | 1.63 | 0.39 | 0.00 |
| | Shallow rocky reef CE | 0.61 | 1.51 | 11.76 | 0.00 |
| | Mangrove W | 0.00 | 2.75 | 0.57 | 0.00 |
| | Shallow rocky reef W | 0.10 | 2.01 | 4.91 | 0.00 |
| *Holacanthus passer* | **Poisson GLM** | | | | |
| | Mangrove CE | 0.001 | 1.83 | 0.05 | 0.00 |
| | Shallow rocky reef CE | 0.02 | 2.14 | 1.23 | 0.00 |
| | Mangrove W | 0.0002 | 2.58 | 0.04 | 0.00 |
| | Shallow rocky reef W | 0.003 | 2.43 | 0.38 | 0.00 |
| *Holacanthus passer* | **NB GLM** | | | | |
| | Mangrove CE | 0.001 | 2.10 | 0.07 | 0.00 |
| | Shallow rocky reef CE | 0.02 | 2.58 | 2.69 | 0.00 |
| | Mangrove W | 0.0001 | 2.77 | 0.04 | 0.00 |
| | Shallow rocky reef W | 0.003 | 2.73 | 0.59 | 0.00 |
| *Lutjanus argentiventris* | **NB GLM** | | | | |
| | Mangrove CE | 2.48 | 0.37 | 5.16 | 1.19 |
| | Shallow rocky reef CE | 0.01 | 1.04 | 0.09 | 0.001 |
| | Mangrove W | 2.54 | 0.63 | 8.72 | 0.74 |
| | Shallow rocky reef W | 0.01 | 1.06 | 0.10 | 0.001 |
| *Mycteroperca olfax* | **Poisson GLM** | | | | |
| | Mangrove CE | 0.08 | 0.48 | 0.19 | 0.03 |
| | Shallow rocky reef CE | 0.02 | 0.81 | 0.09 | 0.003 |
| | Mangrove W | 2.55 | 0.48 | 6.48 | 1.004 |
| | Shallow rocky reef W | 0.61 | 0.66 | 2.22 | 0.17 |
| *Mycteroperca olfax* | **NB GLM** | | | | |
| | Mangrove CE | 0.08 | 0.48 | 0.20 | 0.03 |
| | Shallow rocky reef CE | 0.02 | 0.81 | 0.09 | 0.004 |
| | Mangrove W | 2.66 | 0.48 | 6.77 | 1.05 |
| | Shallow rocky reef W | 0.64 | 0.66 | 2.31 | 0.18 |

| | | | | | |
|---|---|---|---|---|---|
| *Mugil spp.* | **NB GLM** | | | | |
| | Mangrove CE | 4.91 | 0.80 | 23.47 | 1.03 |
| | Shallow rocky reef CE | 0.45 | 1.29 | 5.67 | 0.04 |
| | Mangrove W | 3.39 | 1.51 | 64.84 | 0.18 |
| | Shallow rocky reef W | 0.31 | 1.74 | 9.38 | 0.01 |
| *Scarus ghobban* | **NB GLM** | | | | |
| | Mangrove CE | 0.29 | 0.29 | 0.66 | 1.06 |
| | Shallow rocky reef CE | 0.09 | 0.09 | 0.90 | 0.52 |
| | Mangrove W | 5.12 | 5.12 | 0.92 | 31.05 |
| | Shallow rocky reef W | 1.53 | 1.53 | 0.87 | 8.50 |
| *Sphoeroides annulatus* | **NB GLM** | | | | |
| | Mangrove CE | 3.44 | 0.36 | 7.00 | 1.69 |
| | Shallow rocky reef CE | 0.37 | 0.69 | 1.43 | 0.09 |
| | Mangrove W | 0.74 | 0.64 | 2.59 | 0.21 |
| | Shallow rocky reef W | 0.08 | 0.83 | 0.40 | 0.02 |
| *Stegastes arcifrons* | **NB GLM** | | | | |
| | Mangrove CE | 1.60 | 0.41 | 3.54 | 0.72 |
| | Shallow rocky reef CE | 0.17 | 0.80 | 0.79 | 0.03 |
| | Mangrove W | 2.53 | 0.66 | 9.19 | 0.70 |
| | Shallow rocky reef W | 0.26 | 0.89 | 1.48 | 0.05 |

*a) Abudefdul troschelli*
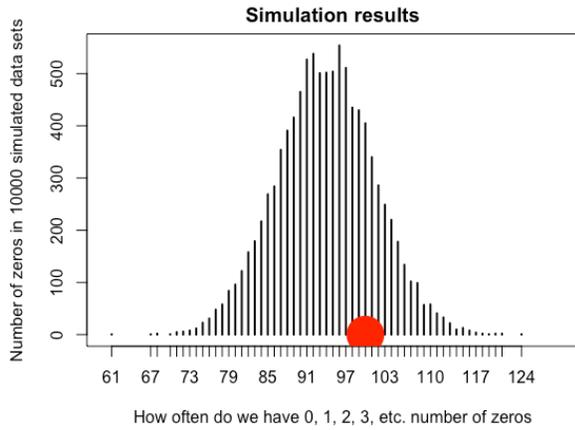
*a) Abudefdul troschelli*
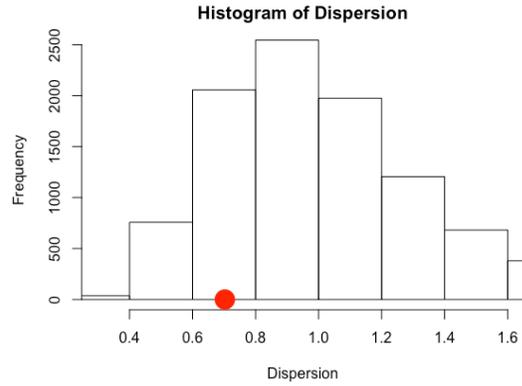


*b) Chaetodon humeralis*
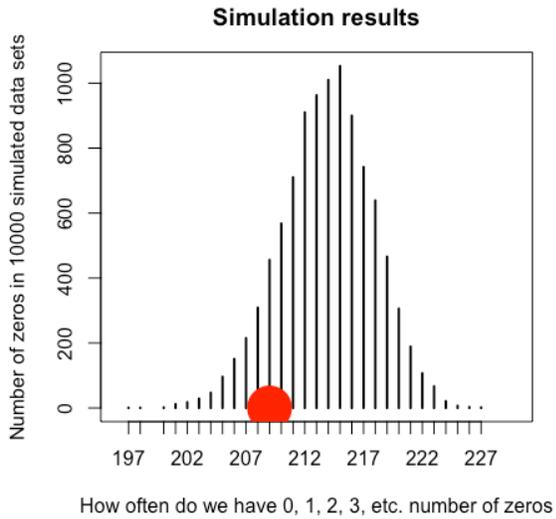
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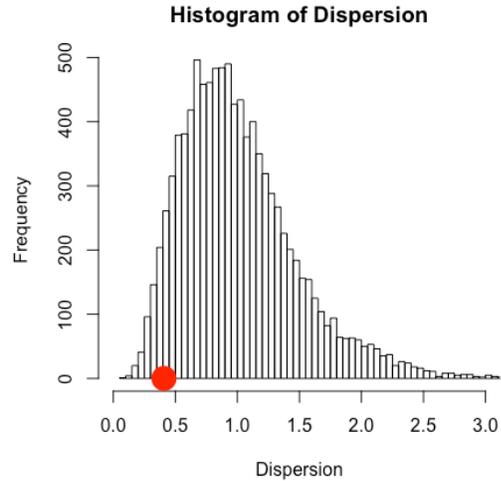


*c) Eucinostomus dowii*
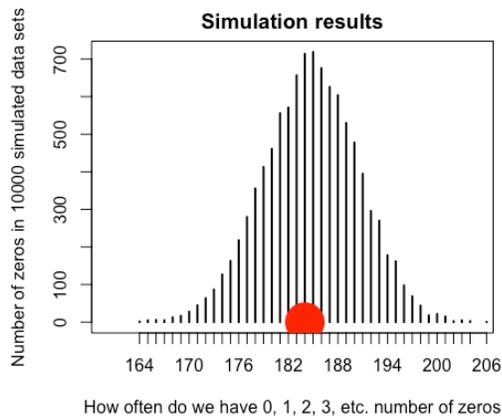
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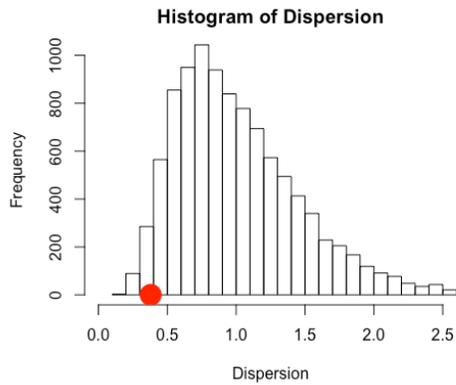
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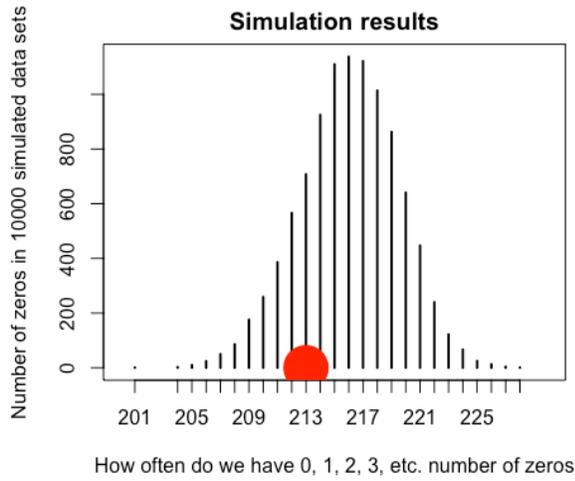


*d) Halichoeres dispilus*
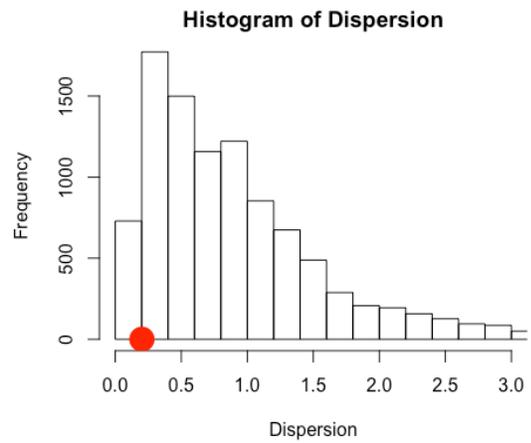


*e) Halocanthus passer- Poisson GLM*
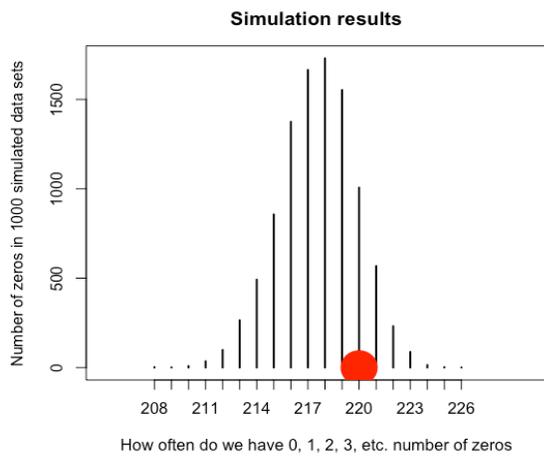


*e) Halocanthus passer – Poisson GLM*
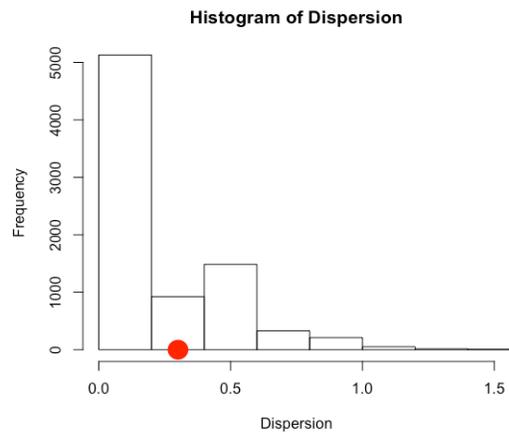


*f) Halocanthus passer- Negative binomial GLM*
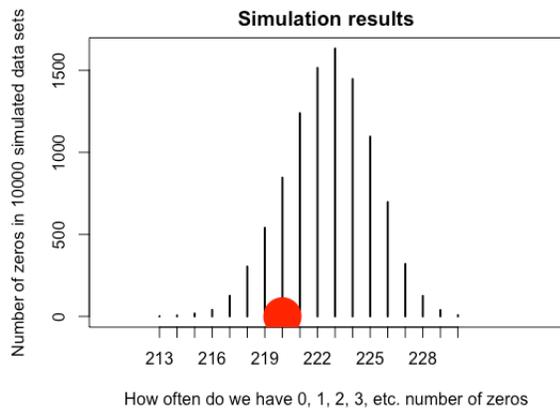


*f) Halocanthus passer- Negative binomial GLM*
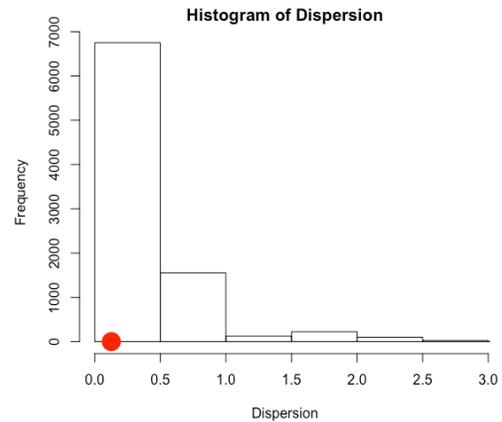
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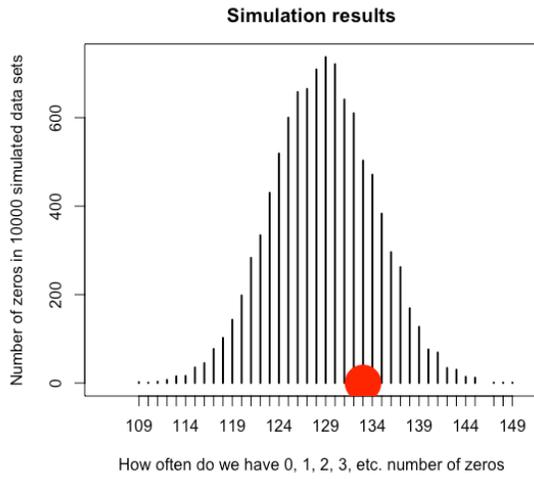
**Simulation results**

*h) Lutjanus argentiventris*
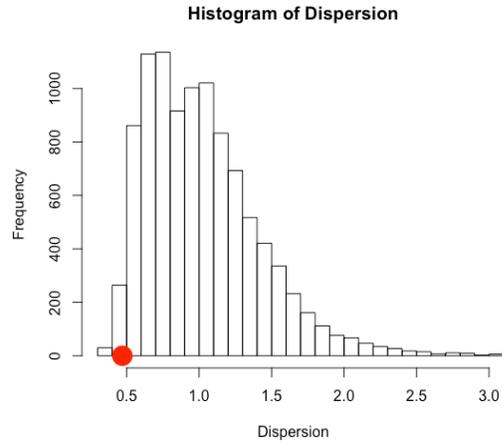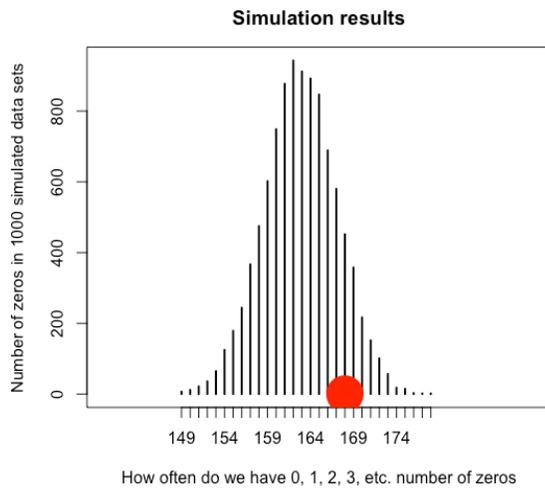
**Histogram of Dispersion**

*i) Mycteroperca olfax -Poisson GLM*

**Simulation results**

*i) Mycteroperca olfax- Poisson GLM*

**Histogram of Dispersion**

*j) Mycteroperca olfax – NB GLM*

**Simulation results**

*j) Mycteroperca olfax- NB GLM*

**Histogram of Dispersion**

8
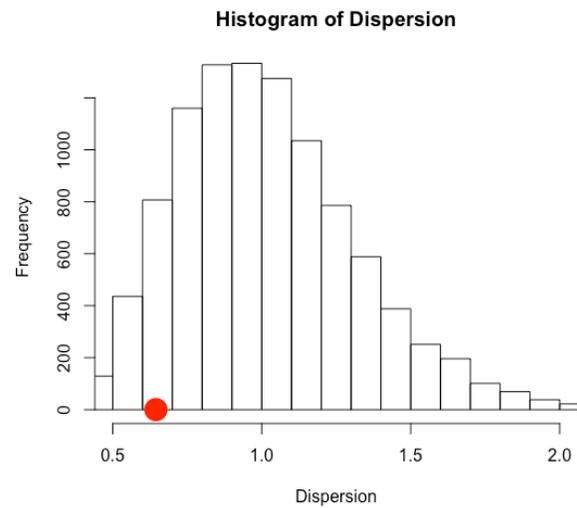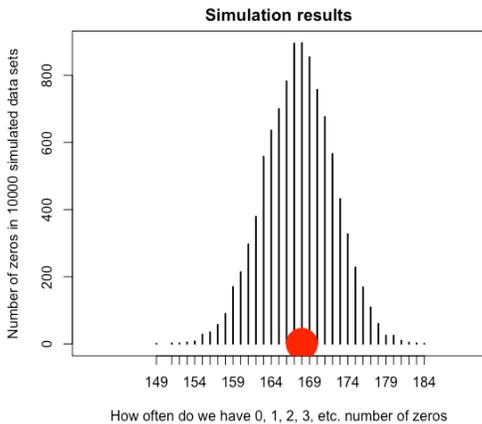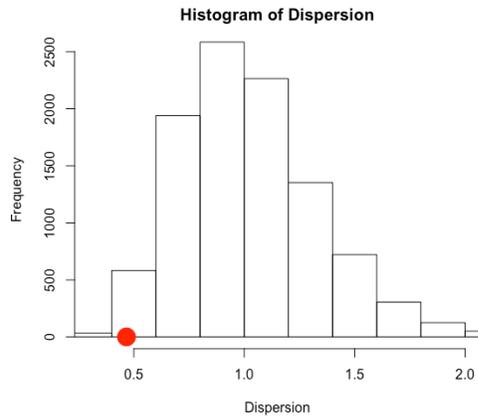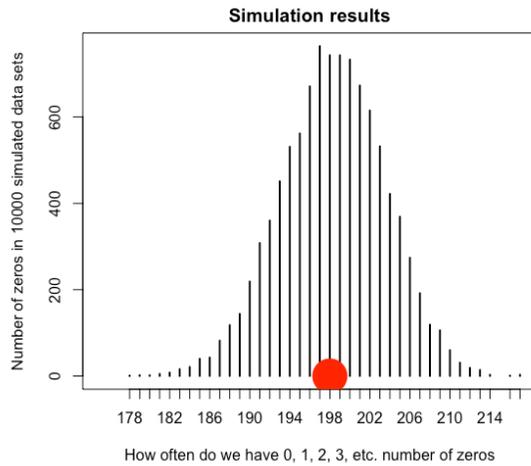
*k) Scarus ghobban*

*k) Scarus ghobban*
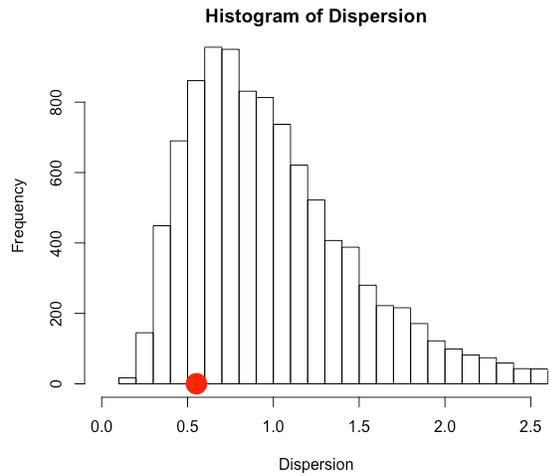


*l) Spheroides annulatus*
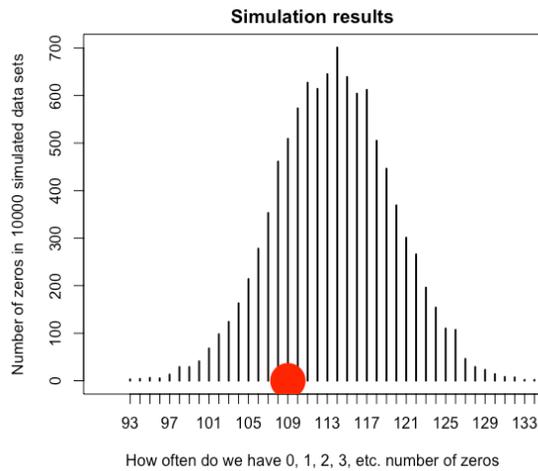
*l) Spheroides annulatus*
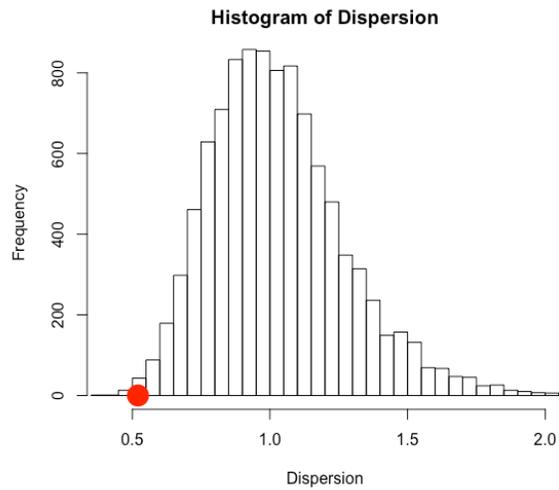


*m) Stegastes arcifrons*
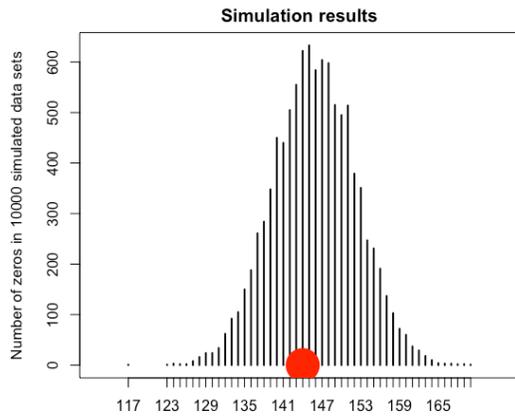
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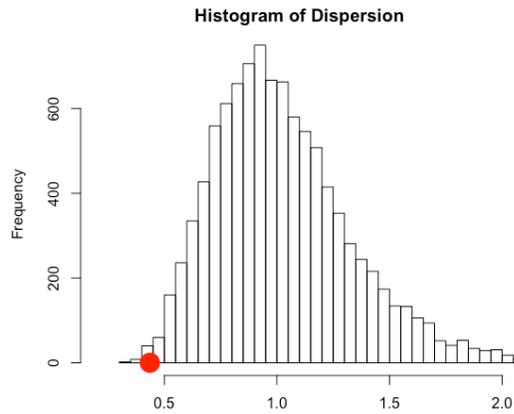


**Fig. S1.** Frequency graphs of the number of zeroes in 10,000 simulated datasets from the negative binomial GLM model for juvenile reef fish species. The big red dot is the number of zeroes for the observed data.

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**Table S5.** Estimated regression parameters, standard errors, z-values, P-values and AIC of adult reef fish species obtained by the zero-altered Poisson models

| Species name | Model | Estimates | SE | Z value | P-value | AIC |
|---|---|---|---|---|---|---|
| *Lutjanus argentiventris* | **Binomial** | | | | | 387.4 |
| | Intercept | -1.500 | 0.294 | -5.09 | $3.5 \times 10^{-7}$ | |
| | Distance to mangroves(km) | -0.183 | 0.073 | -2.48 | 0.013 | |
| | Mangrove perimeter(km) | 0.020 | 0.012 | 1.59 | 0.112 | |
| | **Truncated Poisson** | | | | | 585.9 |
| | Intercept | 0.606 | 0.459 | 1.32 | 0.19 | |
| | Distance to mangroves (km) | 0.096 | 0.053 | 1.81 | 0.07 | |
| | Mangrove perimeter(km) | 0.029 | 0.004 | 7.08 | $1.4 \times 10^{-12}$ | |
| *Mycteroperca olfax* | **Binomial** | | | | | 546.06 |
| | Intercept | -0.688 | 0.168 | -4.09 | $4.3 \times 10^{-5}$ | |
| | Distance to mangroves | -0.085 | 0.042 | -2.02 | 0.043 | |
| | Mangrove perimeter | 0.008 | 0.011 | 0.72 | 0.473 | |
| | **Truncated Poisson** | | | | | 939.00 |
| | Intercept | 0.249 | 0.137 | 1.81 | 0.070 | |
| | Distance to mangroves | -0.020 | 0.040 | -0.52 | 0.605 | |
| | Mangrove perimeter available in 10 km radius | 0.015 | 0.006 | 2.42 | 0.016 | |
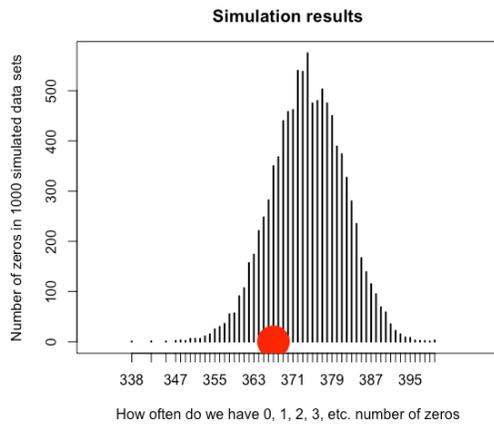
a) *Lutjanus argentiventris*          a) *Lutjanus argentiventris*
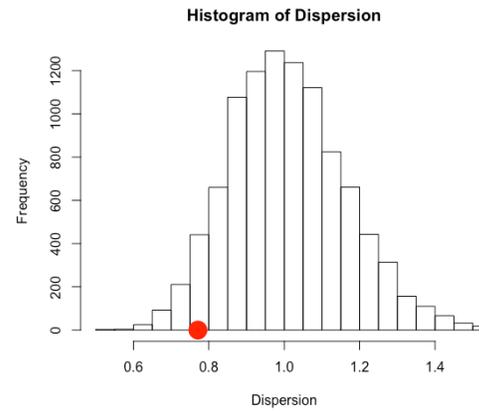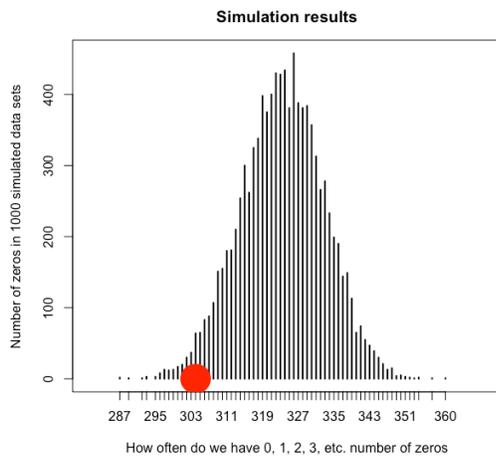


b) *Mycteroperca olfax*          b) *Mycteroperca olfax*
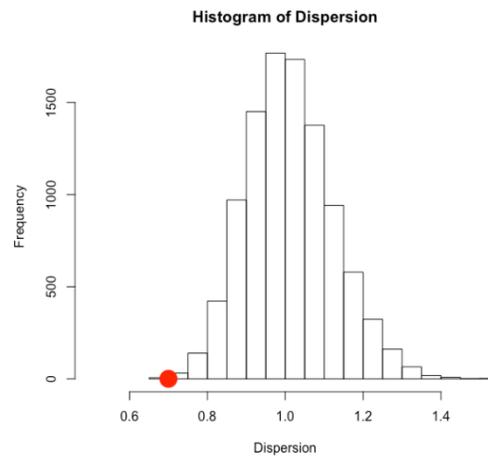


**Fig. S2.** Frequency graphs of the number of zeroes in 10,000 simulated datasets from the negative binomial GLM model for adult fish species. The big red dot is the number of zeroes for the observed data