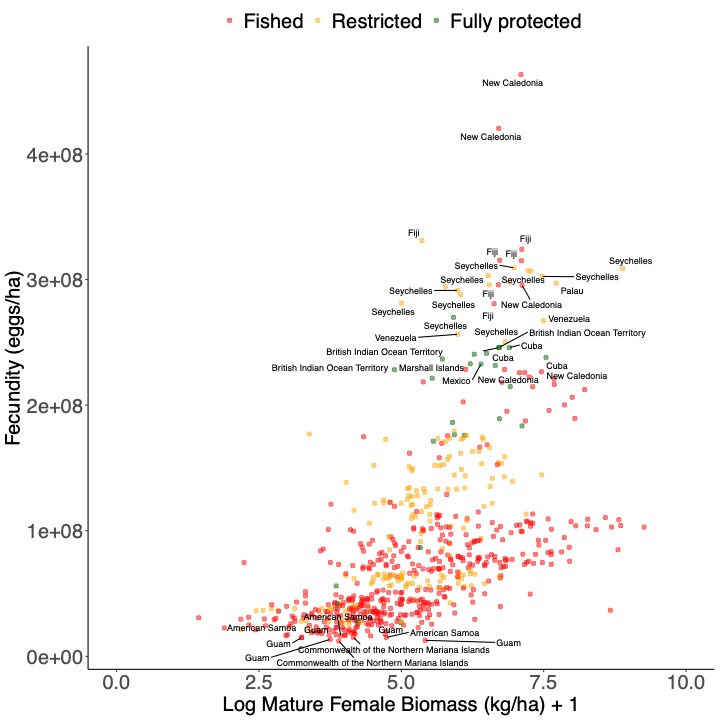
**Global patterns and drivers of fish reproductive potential on coral reefs**

**Supplementary material**

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| **Supplementary Table 1. Median marginal fecundity (log + 1) and 95% UI by marine realm and protection** | | | | | |
| *Marine realm* | *Protection* | *n* | *Prediction* | *Lower* | *Upper* |
| Central Indo-Pacific | Fished | 469 | 18.15 | 16.55 | 19.49 |
| Central Indo-Pacific | Restricted | 198 | 17.95 | 17.01 | 19.06 |
| Central Indo-Pacific | Fully Protected | 22 | 17.69 | 17.15 | 19.02 |
| Eastern Indo-Pacific | Fished | 500 | 17.60 | 16.67 | 18.52 |
| Eastern Indo-Pacific | Restricted | 120 | 17.98 | 17.10 | 18.85 |
| Eastern Indo-Pacific | Fully Protected | 2 | 18.26 | 18.26 | 18.26 |
| Tropical Atlantic | Fished | 40 | 18.47 | 16.82 | 19.10 |
| Tropical Atlantic | Restricted | 38 | 18.61 | 17.54 | 19.41 |
| Tropical Atlantic | Fully Protected | 21 | 19.24 | 18.96 | 19.33 |
| Western Indo-Pacific | Fished | 57 | 17.29 | 16.82 | 18.93 |
| Western Indo-Pacific | Restricted | 126 | 18.71 | 17.57 | 19.53 |
| Western Indo-Pacific | Fully Protected | 40 | 19.29 | 19.10 | 19.41 |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Supplementary Table 2. Sex ratio data** | | | | | | | |
| **Species** | **Family** | **Location** | **F/M sex ratio** | **Ratio proportions** | **Sexual pattern** | **Reference** | **Notes** |
| Lethrinus harak | Lethrinidae | Guam | 3.62 | 0.78 | Protogynous | 1 | Histological examinations |
| Plectropomus areolatus | Epinephelidae | Pohnpei | 2.74 | 0.73 | Protogynous | 2 | Histological examinations |
| Chlorurus spilurus | Labridae; Scarini | Guam | 9.44 | 0.9 | Protogynous | 3 | Visual surveys of colour phases |
| Chlorurus spilurus | Labridae; Scarini | Kosrae | 3.45 | 0.78 | Protogynous | 3 | Visual surveys of colour phases |
| Chlorurus spilurus | Labridae; Scarini | Sorol | 3.26 | 0.77 | Protogynous | 3 | Visual surveys of colour phases |
| Chlorurus spilurus | Labridae; Scarini | Ifalik | 1.71 | 0.63 | Protogynous | 3 | Visual surveys of colour phases |
| Chlorurus spilurus | Labridae; Scarini | Lamotrek | 2 | 0.67 | Protogynous | 3 | Visual surveys of colour phases |
| Chlorurus spilurus | Labridae; Scarini | Pohnpei | 3.16 | 0.76 | Protogynous | 3 | Visual surveys of colour phases |
| Chlorurus spilurus | Labridae; Scarini | Yap | 1.93 | 0.66 | Protogynous | 3 | Visual surveys of colour phases |
| Calotomus carolinus | Labridae; Scarini | Guam | 0.79 | 0.44 | Protogynous | 3 | Histological examinations |
| Cetoscarus bicolor | Labridae; Scarini | Pohnpei | 2.36 | 0.7 | Protogynous | 3 | Histological examinations |
| Chlorurus frontalis | Labridae; Scarini | Guam | 1.24 | 0.55 | Protogynous | 3 | Histological examinations |
| Chlorurus microrhinos | Labridae; Scarini | Guam | 4 | 0.8 | Protogynous | 3 | Histological examinations |
| Chlorurus spilurus | Labridae; Scarini | Guam | 1.55 | 0.61 | Protogynous | 3 | Histological examinations |
| Hipposcarus longiceps | Labridae; Scarini | Pohnpei | 1.91 | 0.66 | Protogynous | 3 | Histological examinations |
| Scarus altipinnis | Labridae; Scarini | Guam | 1.65 | 0.62 | Protogynous | 3 | Histological examinations |
| Scarus forsteni | Labridae; Scarini | Guam | 2.2 | 0.69 | Protogynous | 3 | Histological examinations |
| Scarus ghobban | Labridae; Scarini | Pohnpei | 1.82 | 0.65 | Protogynous | 3 | Histological examinations |
| Scarus psittacus | Labridae; Scarini | Guam | 1.11 | 0.53 | Protogynous | 3 | Histological examinations |
| Scarus rubroviolaceus | Labridae; Scarini | Guam | 1.28 | 0.56 | Protogynous | 3 | Histological examinations |
| Scarus schlegeli | Labridae; Scarini | Guam | 0.81 | 0.45 | Protogynous | 3 | Histological examinations |
| Epinephelus maculatus | Epinephelidae | Chuuk | 3.67 | 0.79 | Protogynous | 4 | Histological examinations |
| Lethrinus obsoletus | Lethrinidae | Saipan | 3.67 | 0.79 | Juvenile protogyny | 5 | Histological examinations |
| Scarus rubroviolaceus | Labridae; Scarini | Tutuila | 2.19 | 0.69 | Protogynous | 6 | Histological examinations |
| Hipposcarus longiceps | Labridae; Scarini | Guam | 1.19 | 0.54 | Protogynous | 7 | Histological examinations |
| Calotomus carolinus | Labridae; Scarini | Oahu | 3.02 | 0.75 | Protogynous | 8 | Histological examinations |
| Scarus psittacus | Labridae; Scarini | Oahu | 2.4 | 0.71 | Protogynous | 8 | Histological examinations |
| Chlorurus spilurus | Labridae; Scarini | Oahu | 1.51 | 0.6 | Protogynous | 8 | Histological examinations |
| Chlorurus perspicillatus | Labridae; Scarini | Oahu | 1.1 | 0.52 | Protogynous | 8 | Histological examinations |
| Scarus rubroviolaceus | Labridae; Scarini | Oahu | 2.18 | 0.69 | Protogynous | 8 | Histological examinations |
| Lethrinus xanthochilus | Lethrinidae | Tutuila | 1.4 | 0.58 | Protogynous | 9 | Histological examinations |
| Plectropomus areolatus | Epinephelidae | Chuuk | 5 | 0.83 | Protogynous | 10 | Histological examinations |
| Chlorurus japanensis | Labridae; Scarini | Tutuila | 1.19 | 0.54 | Protogynous | 11 | Histological examinations |
| Lethrinus rubrioperculatus | Lethrinidae | Tutuila | 1.74 | 0.63 | Protogynous | 11 | Histological examinations |
| Lethrinus olivaceus | Lethrinidae | Okinawa | 1.08 | 0.52 | Protogynous | 12 | Histological examinations |
| Lethrinus atkinsoni | Lethrinidae | Okinawa | 0.33 | 0.25 | Protogynous | 13 | Histological examinations |
| Lethrinus xanthochilus | Lethrinidae | Tutuila | 1.4 | 0.58 | Protogynous | 9 | Histological examinations |
| Scolopsis lineata | Nemipteridae | PNG | 1.71 | 0.63 | Protogynous | 14 | Histological examinations |
| Scarus rubroviolaceus | Labridae; Scarini | Seychelles | 5.20625 | 0.84 | Protogynous | 15 | Histological examinations |
| Chlorurus microrhinos | Labridae; Scarini | Okinawa | 2.56521739 | 0.72 | Protogynous | 16 | Histological examinations |
| Chlorurus sordidus | Labridae; Scarini | GBR | 3.11 | 0.76 | Protogynous | 17 | Histological examinations |
| Scarus frenatus | Labridae; Scarini | GBR | 1.28 | 0.56 | Protogynous | 17 | Histological examinations |
| Plectropomus laevis | Serranidae | GBR | 4 | 0.8 | Protogynous | 18 | Histological examinations |
| Cephalopholis argus | Serranidae | Hawaii | 3.9 | 0.8 | Protogynous | 19 | Histological examinations |
| Plectropomus leopardus | Serranidae | Okinawa | 11.29 | 0.92 | Protogynous | 20 | Histological examinations |
| Acanthopagrus bifasciatus | Sparidae | Abu Dhabi | 1.9 | 0.66 | Protogynous | 21 | Macroscopic examination |
| Scolopsis monogramma | Nemipteridae | Okinawa | 2.86486487 | 0.74125874 | Protogynous | 22 | Histological examinations |
| Epinephelus labriformis | Serranidae | BahÌa de Navidad, Jalisco, Mexico | 1.24343675 | 0.55425532 | Protogynous | 23 | Histological examinations |
| Epinephelus itajara | Serranidae | Abrolhos Bank, eastern Brazil | 16 | 0.94117647 | Protogynous | 24 | Histological examinations |
| Bodianus frenchii | Labridae | Western Australia | 1.484 | 0.59742351 | Protogynous | 25 | Histological examinations |
| Halichoeres trimaculatus | Labridae | Okinawa | 4.59016393 | 0.82111437 | Protogynous and protandrous | 26 | Histological examinations |
| Lachnolaimus maximus | Labridae | Yucatan Penninsula | 2.79435484 | 0.73645058 | Protogynous | 27 | Histological examinations |
| Cheilinus undulatus | Labridae | Palau | 8 | 0.88888889 | Protogynous | 28 | Visual surveys |
| Neocirrhites armatus | Cirrhitidae | GBR | 1.75 | 0.63636364 | Protogynous | 29 | Histological examinations |
| Parapercis cylindrica | Pinguipedidae | GBR | 6 | 0.85714286 | Protogynous | 30 | Visual surveys |
| Acanthopagrus berda | Sparidae | Kearla, India | 1.21014493 | 0.54754098 | Protandrous | 31 | Histological examinations |
| Diplodus sargus sargus | Sparidae | Gulf of Tunis | 2.24324324 | 0.69166667 | Protogynous | 32 | Histological examinations |

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***Supplementary Figure 1.*** *Mean (grouped by protection, country/nation/territory, and reef cluster) modelled fecundity (standardised across methodology, habitat, and depth) plotted against estimated mature female biomass (logged). Points (n = 651) are coloured according to level of protection, where red is fished, orange is restricted, and fully protected areas are green.*



**Supplementary Figure 2.** Conditional effects of protection on A) the proportional biomass (total mature female biomass) of fecundity classes, B) the proportional abundance (all mature female fish) of fecundity classes, and C) the proportional biomass (proportion of total biomass of all fish) of size classes; and the conditional effects of total biomass on D) the proportional biomass (total mature female biomass) of fecundity classes, E) the proportional abundance (all mature female fish) of fecundity classes, and F) the proportional biomass of size classes. Median values and 95% UI (n = 1,000 posterior draws) are illustrated. Points (n = 4899, 1633 sites x 3 categories) represent raw calculated values. Colours correspond to fecundity or size categories, where the small/low category is dark purple, the medium category is light purple, and the large/high category is orange.



***Supplementary Figure 3.*** *Proportion of total fish biomass comprised of mature fish (fish >= length at maturity) across fished, restricted, and unfished sites (conditional effect of protection). Points indicate median values and lines indicate 95% UI.* Points (n=1633) represent raw calculated values.



***Supplementary Figure 4.*** *Standardised effect size and 95% UI of predictors (n = 4,000 posterior draws) on A) Lutjanidae, B) Labridae (Scarini), and C) Serranidae.* *Points are coloured black for a negative effect size, grey for a positive effect size, and blank for an effect size that overlaps with 0. Model incorporates zeros (in addition to non-zero data used in models for Figure 2) and uses a hurdle log-normal distribution. No measurement error is incorporated in these models.*

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***Supplementary Figure 5.*** *Model validation for length at maturity model showing a) trace plots and b) posterior predictive checks*

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***Supplementary Figure 6.*** *Model validation for sex ratio model showing a) trace plots and b) posterior predictive checks*

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***Supplementary Figure 7.*** *Model validation for fecundity model showing a) trace plots and b) posterior predictive checks*

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***Supplementary Figure 8.*** *Model validation for the site-level fecundity model showing a) trace plots and b) posterior predictive checks*

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***Supplementary Figure 9.*** *Model validation for the global drivers - biomass > 20cm model showing a) trace plots and b) posterior predictive checks*

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***Supplementary Figure 10.*** *Model validation for the global drivers – fecundity model showing a) trace plots and b) posterior predictive checks*

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***Supplementary Figure 11.*** *Model validation for the global drivers – mature female biomass model a) trace plots and b) posterior predictive checks*

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***Supplementary Figure 12.*** *Model validation for the global drivers – Serranidae hurdlelog model a) trace plots and b) posterior predictive checks*

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***Supplementary Figure 13.*** *Model validation for the global drivers – Serranidae no zeros model a) trace plots and b) posterior predictive checks*

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***Supplementary Figure 14.*** *Model validation for the global drivers – Scarini hurdlelog model a) trace plots and b) posterior predictive checks*

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***Supplementary Figure 15.*** *Model validation for the global drivers – Scarini no zeros model a) trace plots and b) posterior predictive checks*

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***Supplementary Figure 16.*** *Model validation for the global drivers – Lutjanidae hurdlelog model a) trace plots and b) posterior predictive checks*

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***Supplementary Figure 17.*** *Model validation for the global drivers – Lutjanidae no zeros model a) trace plots and b) posterior predictive checks*

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