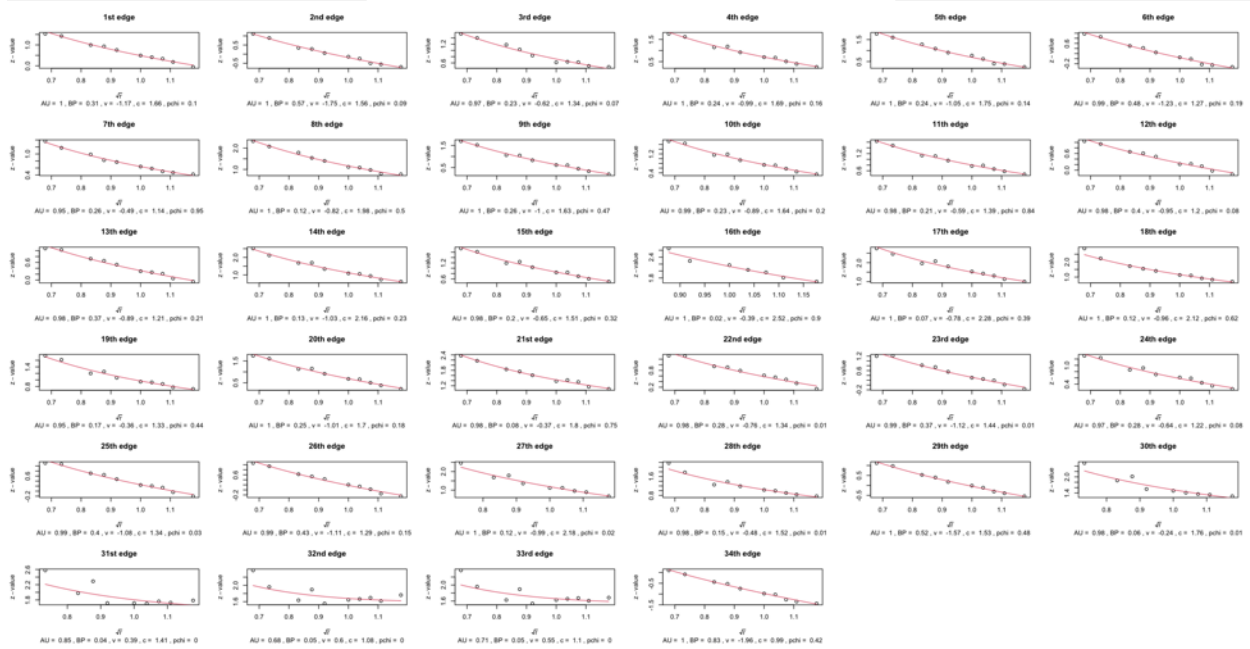**Figure S1**: Diagnostic plots of the multiscale bootstrapping for each cluster in Figure 6.
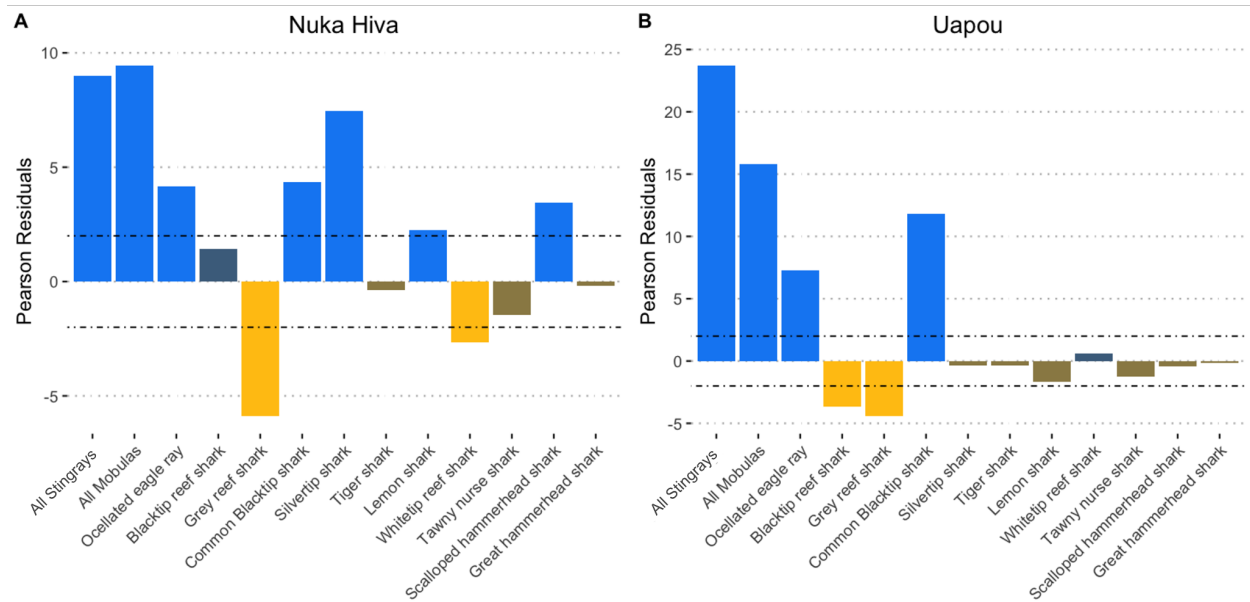

Figure S2: Plots show Pearson's residuals from chi-squared test comparing species mean MaxN at island A) Nuka Hive and B) Uapou in the Marquesas. Species with Pearson's >2 indicates a significant positive association (shown in bright blue), and is observed in that island more than expected, conversely species with a Pearson's <-2 indicates a significant negative association (shown in bright yellow) and is observed in that island less than expected. Species that showed no significant association are in dull blue and yellow.

Figure S3: Plots show Pearson's residuals from chi-squared test comparing species mean MaxN at island A) Tetiaroa, B) Tahiti, and C) Moorea in the Windward Society Islands. Species with Pearson's >2 indicates a significant positive association (shown in bright blue), and is observed in that island more than expected, conversely species with a Pearson's < -2 indicates a significant negative association (shown in bright yellow) and is observed in that island less than expected. Species that showed no significant association are in dull blue and yellow.
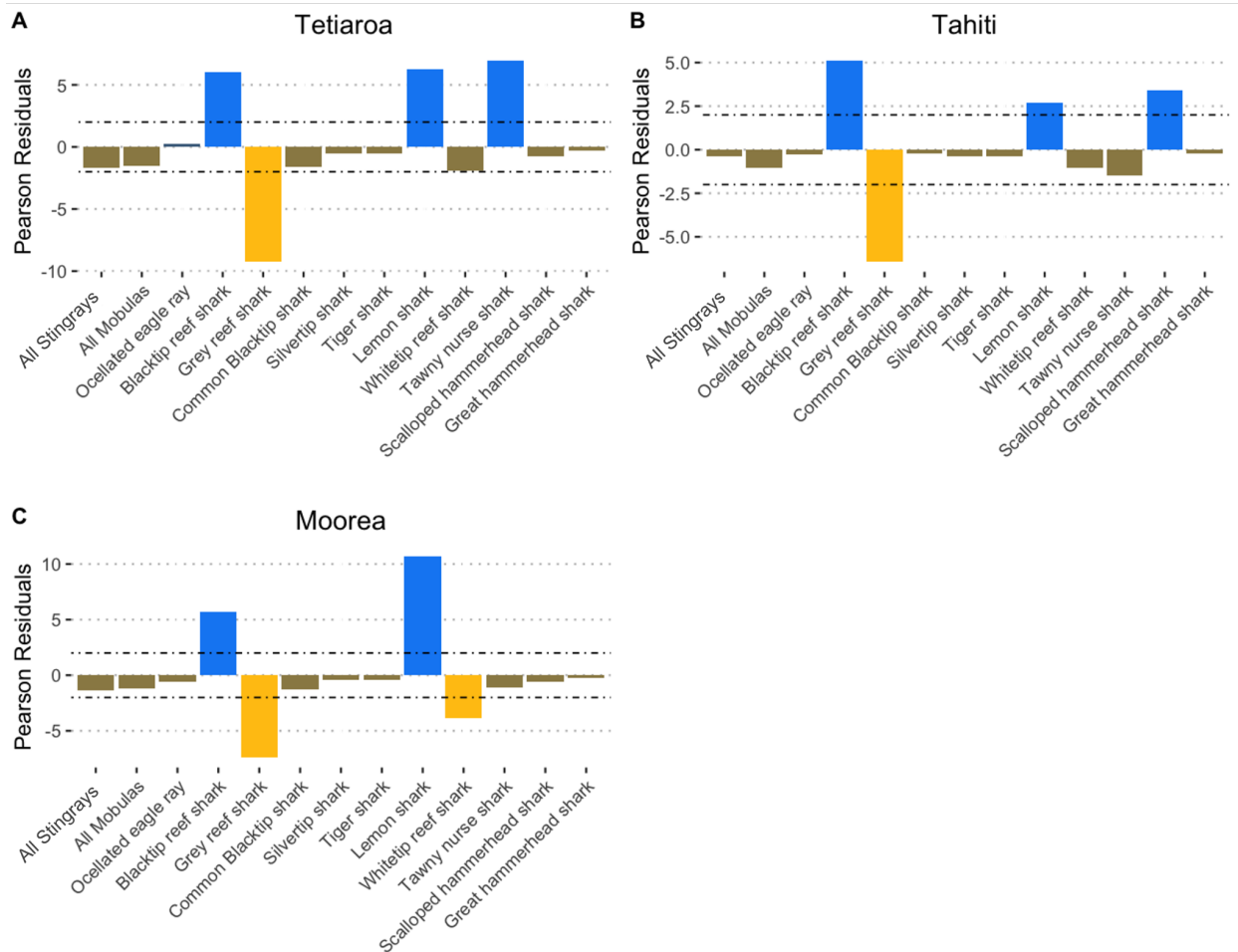
Figure S4: Plots show Pearson's residuals from chi-squared test comparing species mean MaxN at island A) Raiatea and B) Maupiti in the Leeward Society Islands. Species with Pearson's >2 indicates a significant positive association (shown in bright blue), and is observed in that island more than expected, conversely species with a Pearson's < -2 indicates a significant negative association (shown in bright yellow) and is observed in that island less than expected. Species that showed no significant association are in dull blue and yellow.
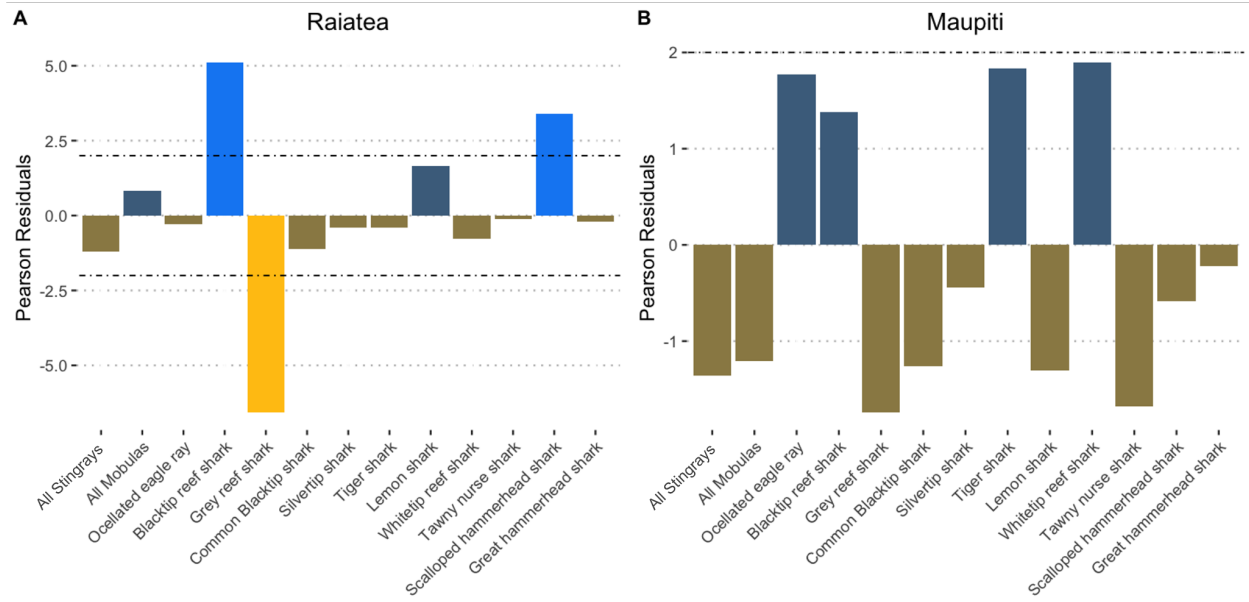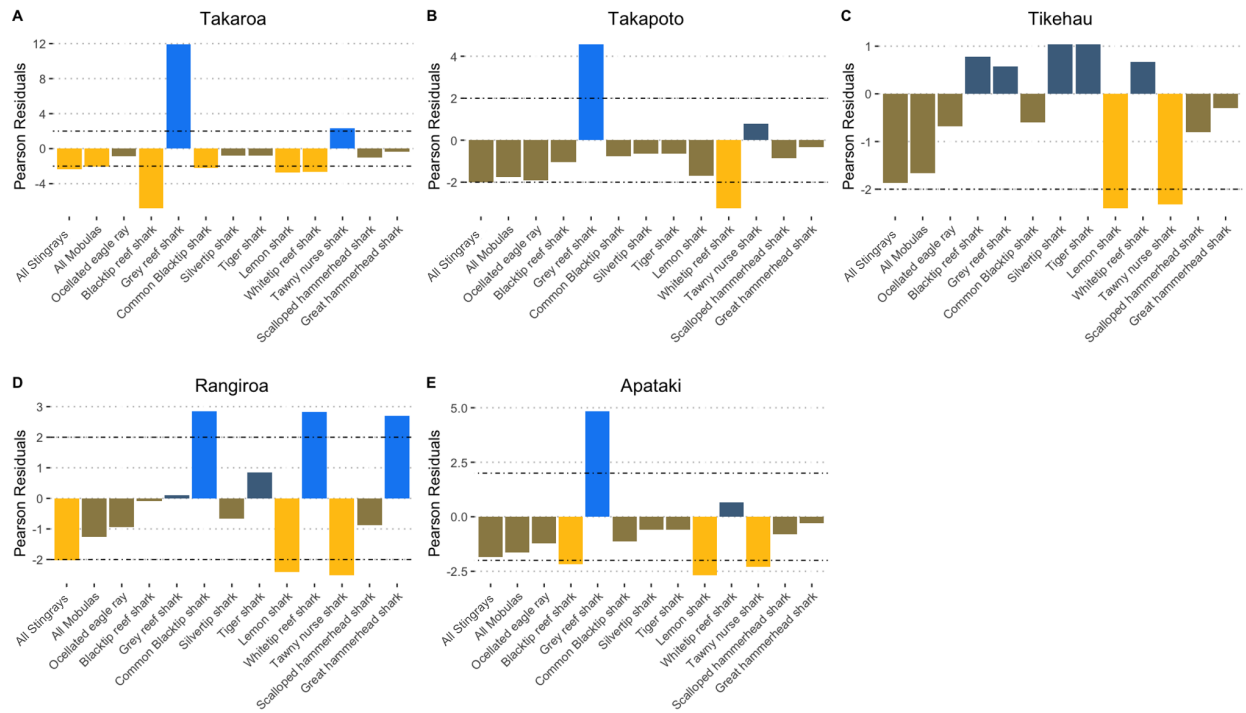
Figure S5: Plots show Pearson's residuals from chi-squared test comparing species mean MaxN at island A) Takaroa, B) Takapoto, C) Tikehau, D) Rangiora, and E) Apataki in the West Tuamotus. Species with Pearson's >2 indicates a significant positive association (shown in bright blue), and is observed in that island more than expected, conversely species with a Pearson's <-2 indicates a significant negative association (shown in bright yellow) and is observed in that island less than expected. Species that showed no significant association are in dull blue and yellow.
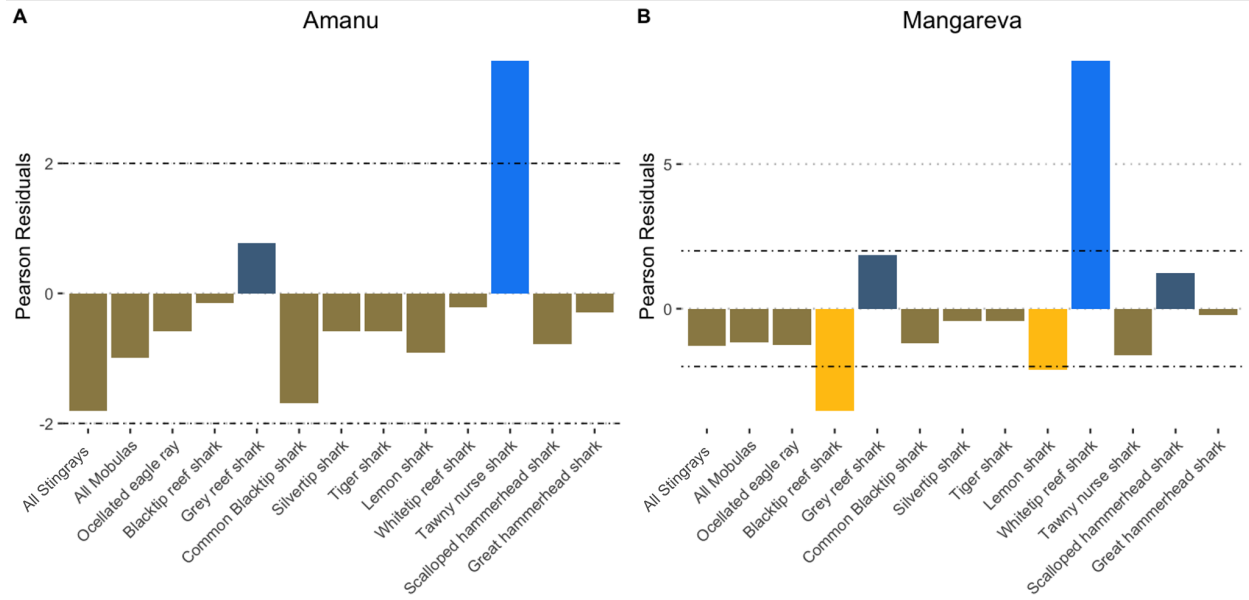
Figure S6: Plots show Pearson's residuals from chi-squared test comparing species mean MaxN at island A) Amanu and B) Mangareva in the East Tuamotus. Species with Pearson's >2 indicates a significant positive association (shown in bright blue), and is observed in that island more than expected, conversely species with a Pearson's <-2 indicates a significant negative association (shown in bright yellow) and is observed in that island less than expected. Species that showed no significant association are in dull blue and yellow.
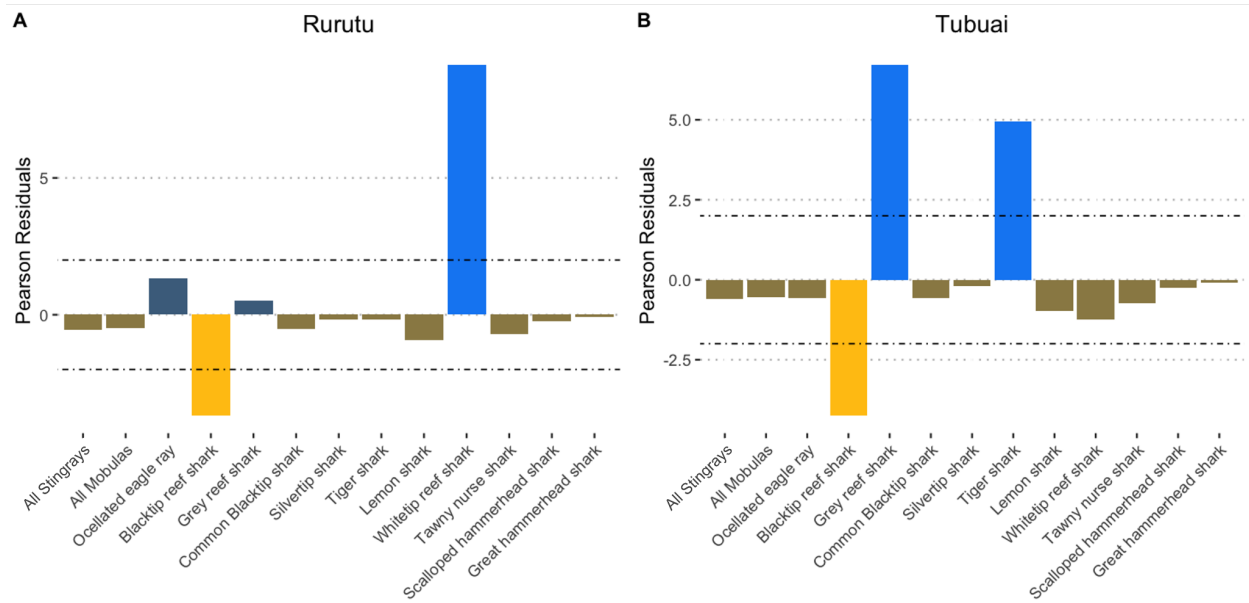
Figure S7: Plots show Pearson's residuals from chi-squared test comparing species mean MaxN at island A) Rurutu and B) Tubuai in the Austral islands. Species with Pearson's >2 indicates a significant positive association (shown in bright blue), and is observed in that island more than expected, conversely species with a Pearson's < -2 indicates a significant negative association (shown in bright yellow) and is observed in that island less than expected. Species that showed no significant association are in dull blue and yellow.