0.1 Longline Fishery Data

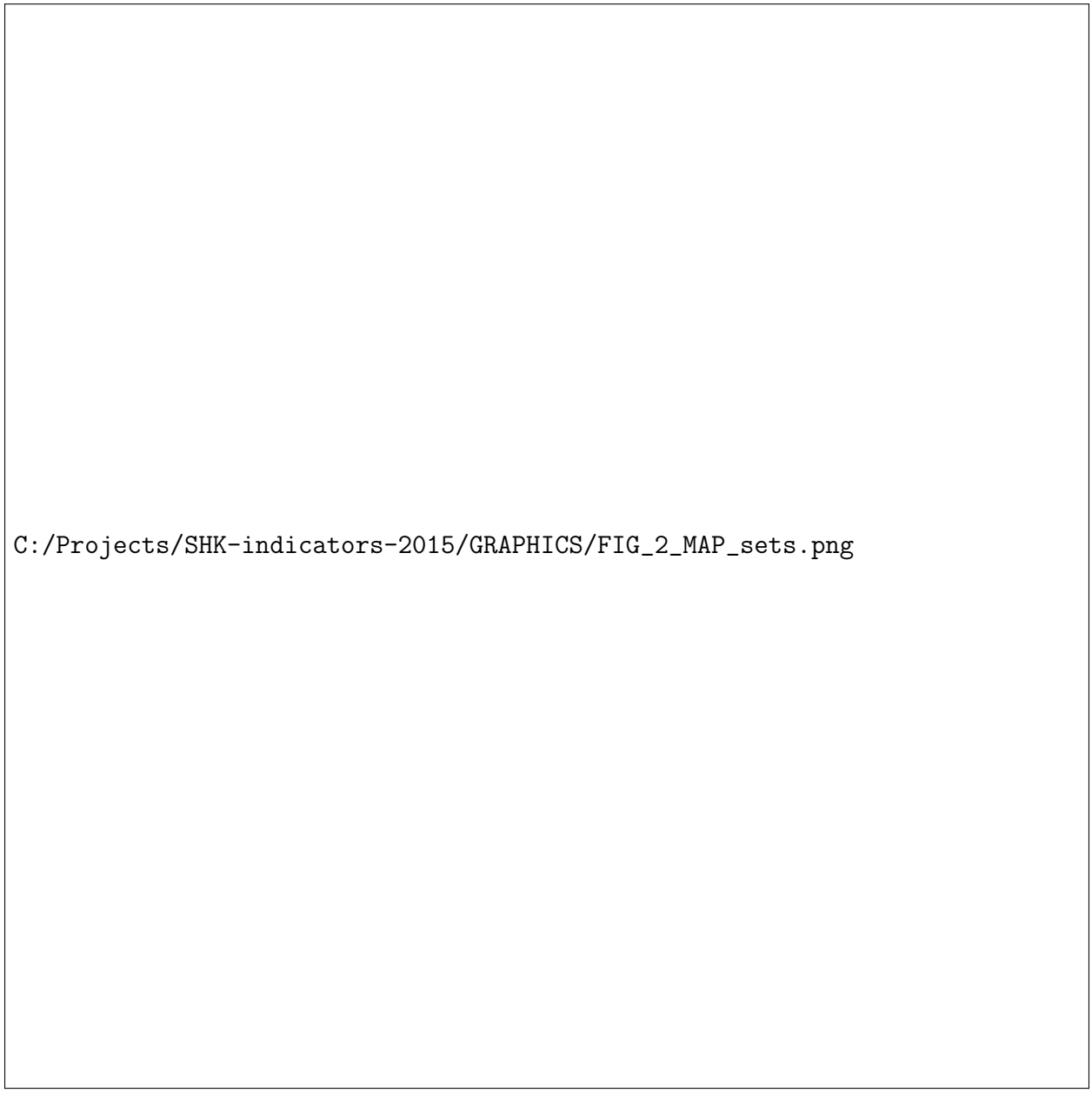


Figure 1: Map of WCPO and observed effort.

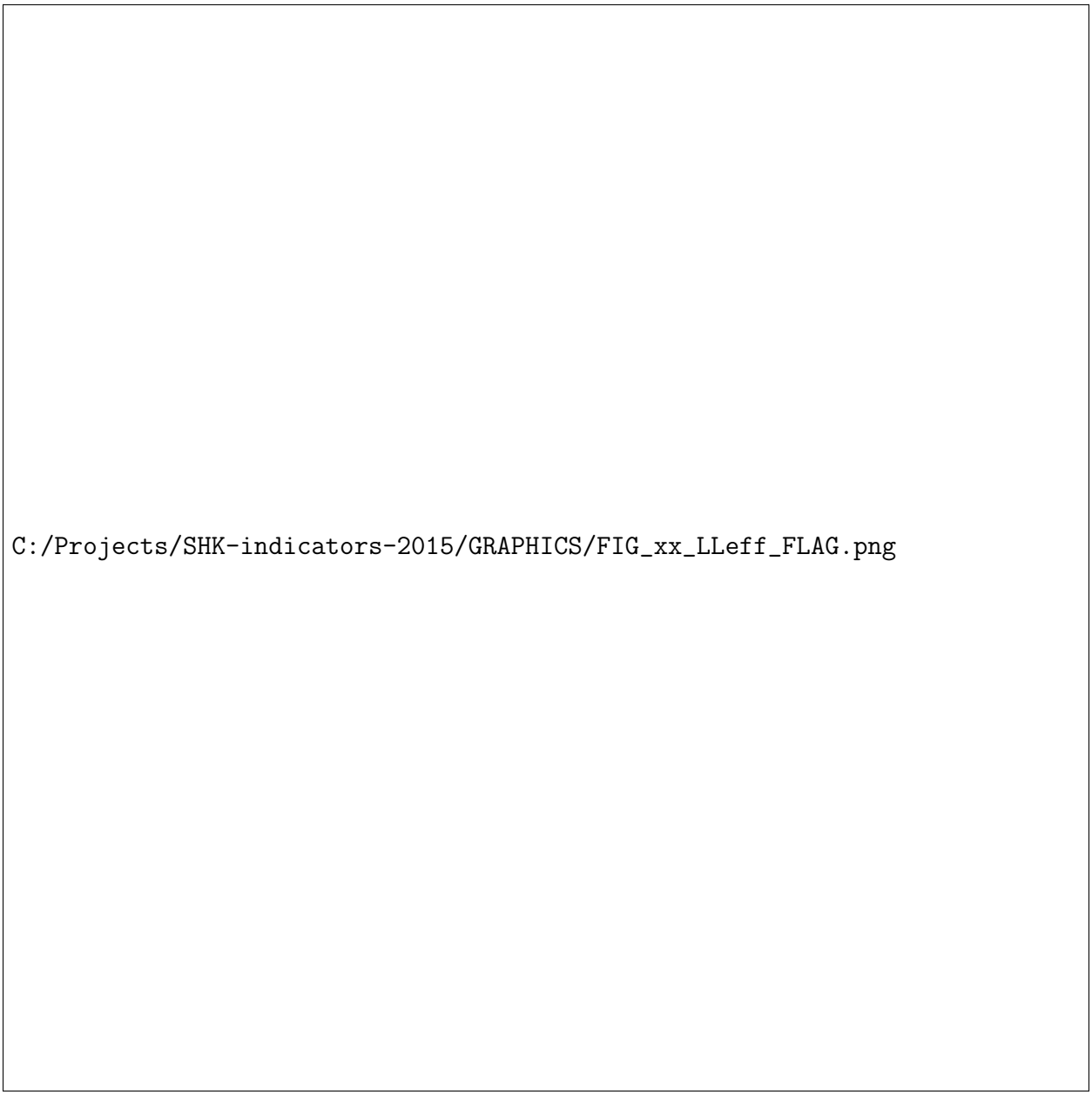


Figure 2: Total number of hooks fished by flag (for the top four fishing nations, and all others combined) based on aggregated (5x5 degree square) data, for six regions of the WCPFC Statistical Area.

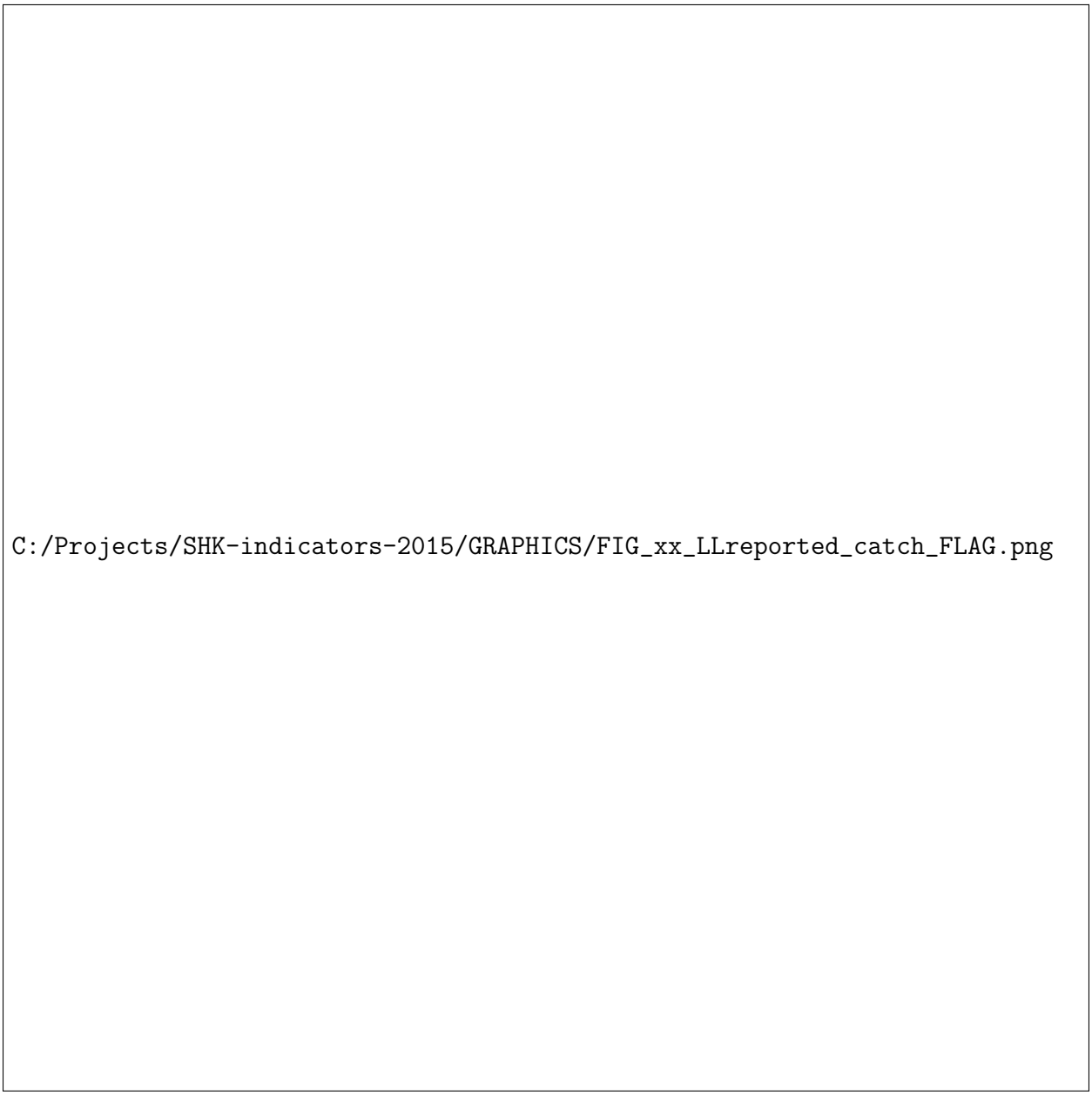


Figure 3: Total number of reported sharks by flag (for the top four fishing nations, and all others combined) based aggregated (5x5 degree square) data, for six regions of the WCPFC Statistical Area.

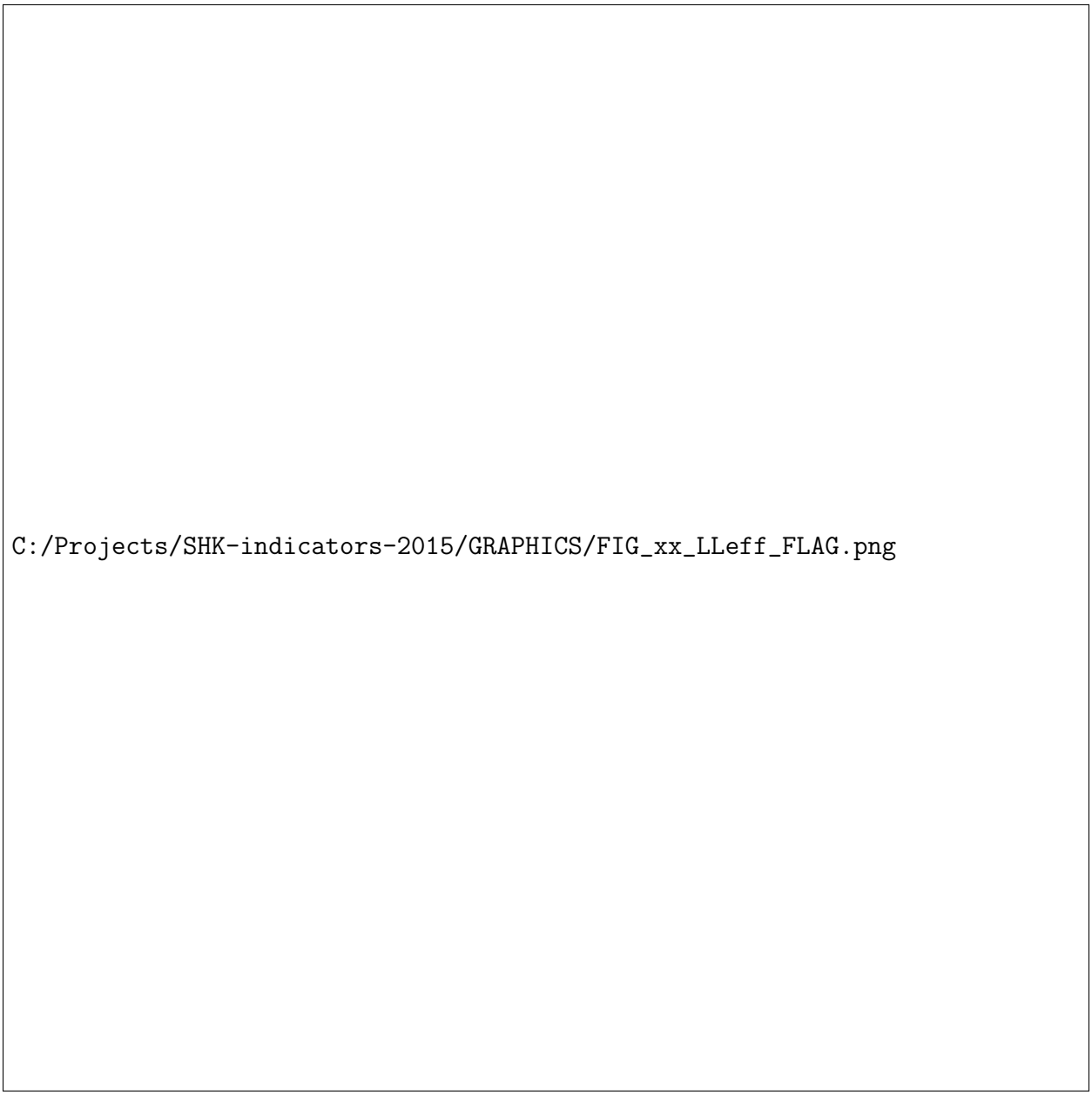


Figure 4: Total number of hooks observed by flag (for the top four fishing nations) based on longline observer records held by the SPC-OFP, for six regions of the WCPFC Statistical Area

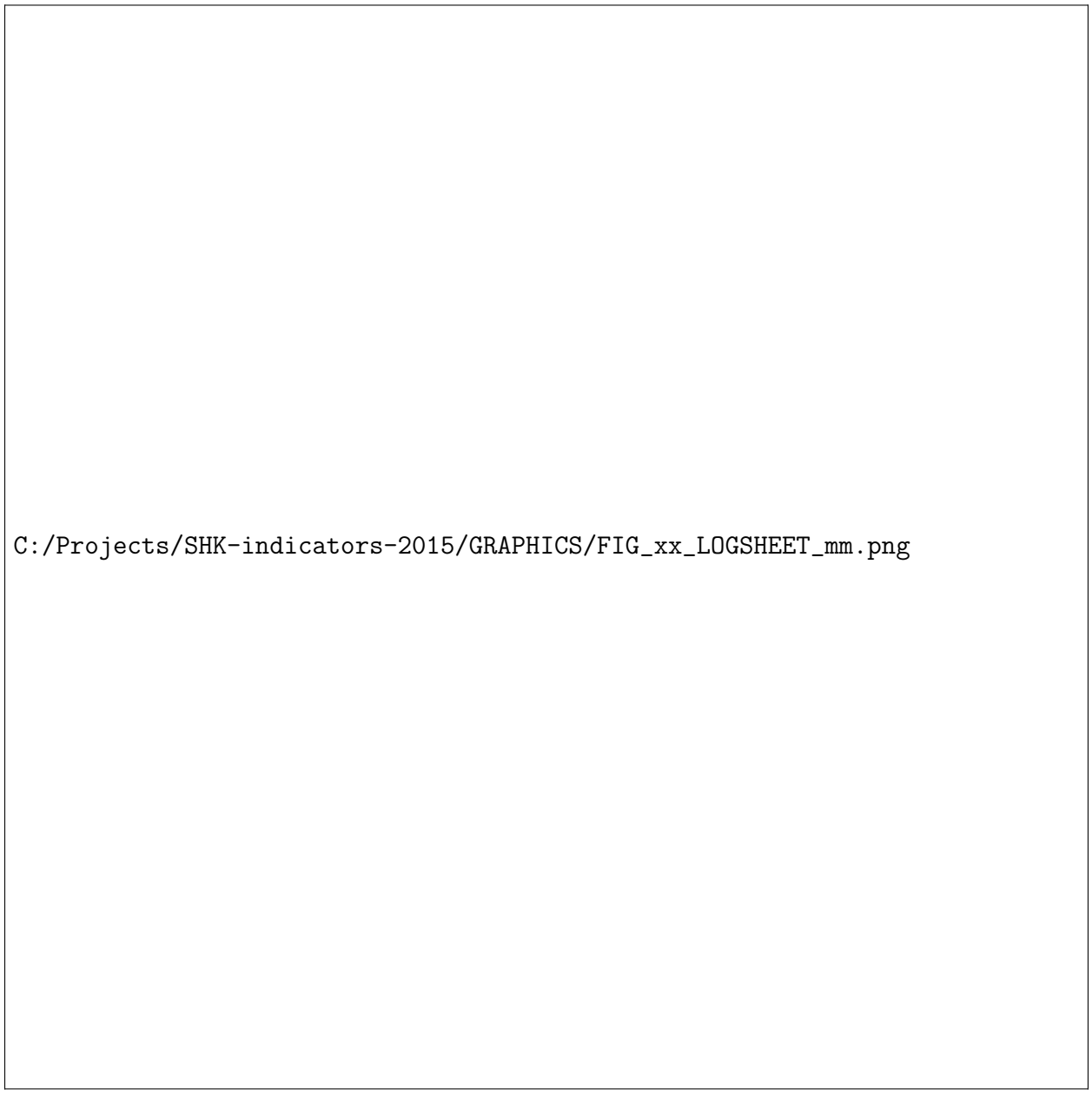


Figure 5: Logsheet effort by month.

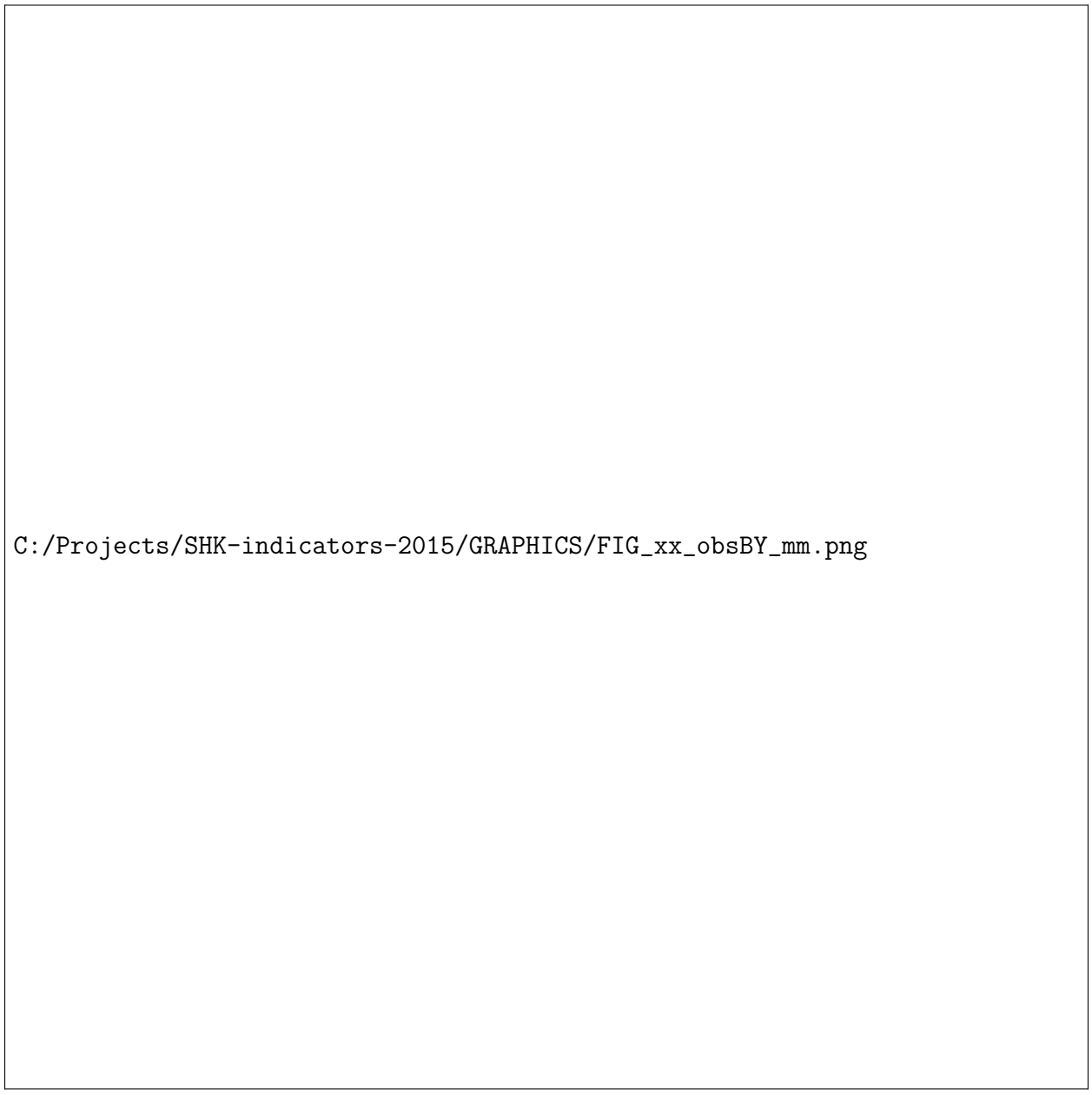


Figure 6: Observed effort by month.

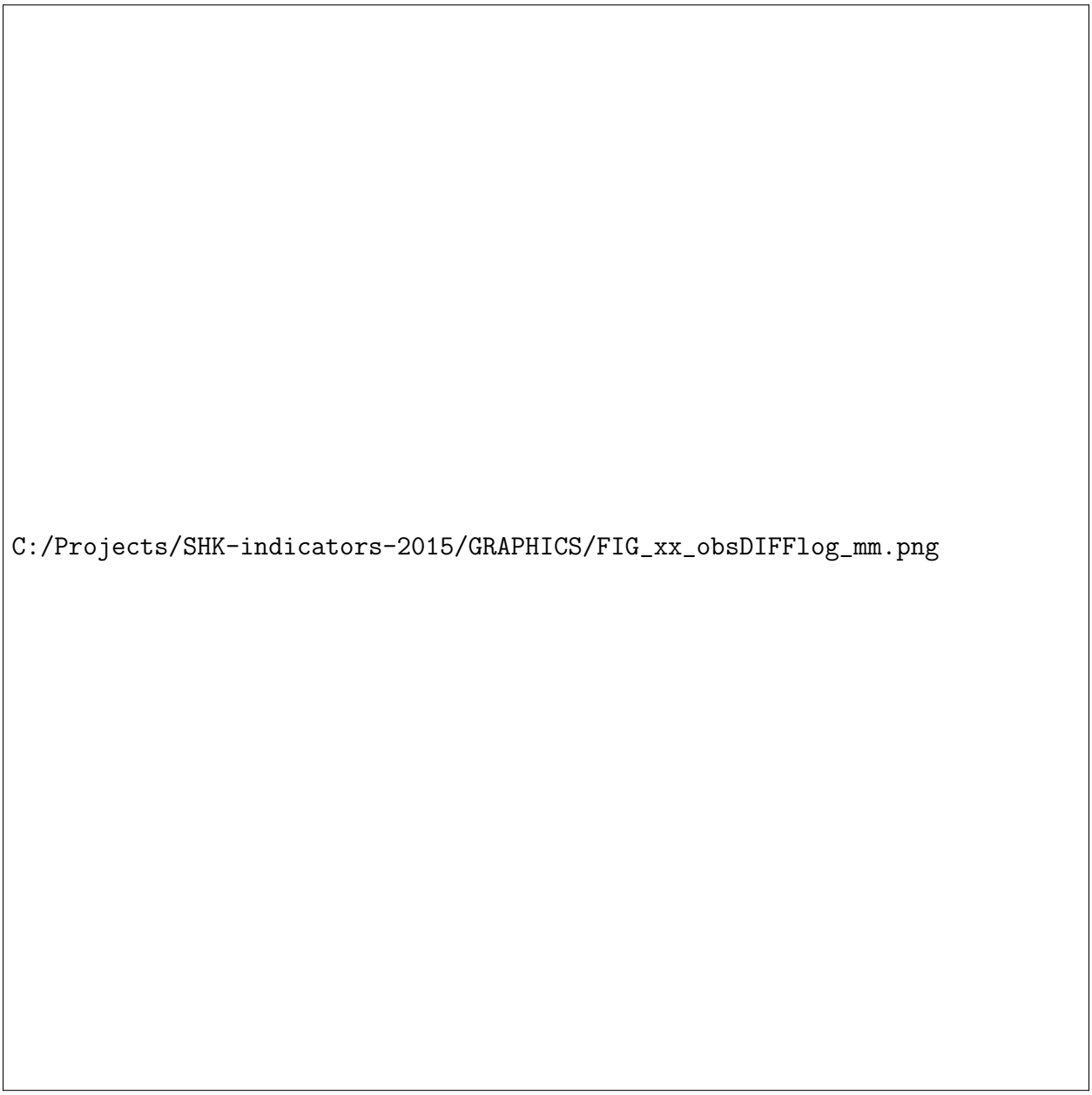


Figure 7: Absolute percent difference in effort between reported (logsheet) effort and observed effort.

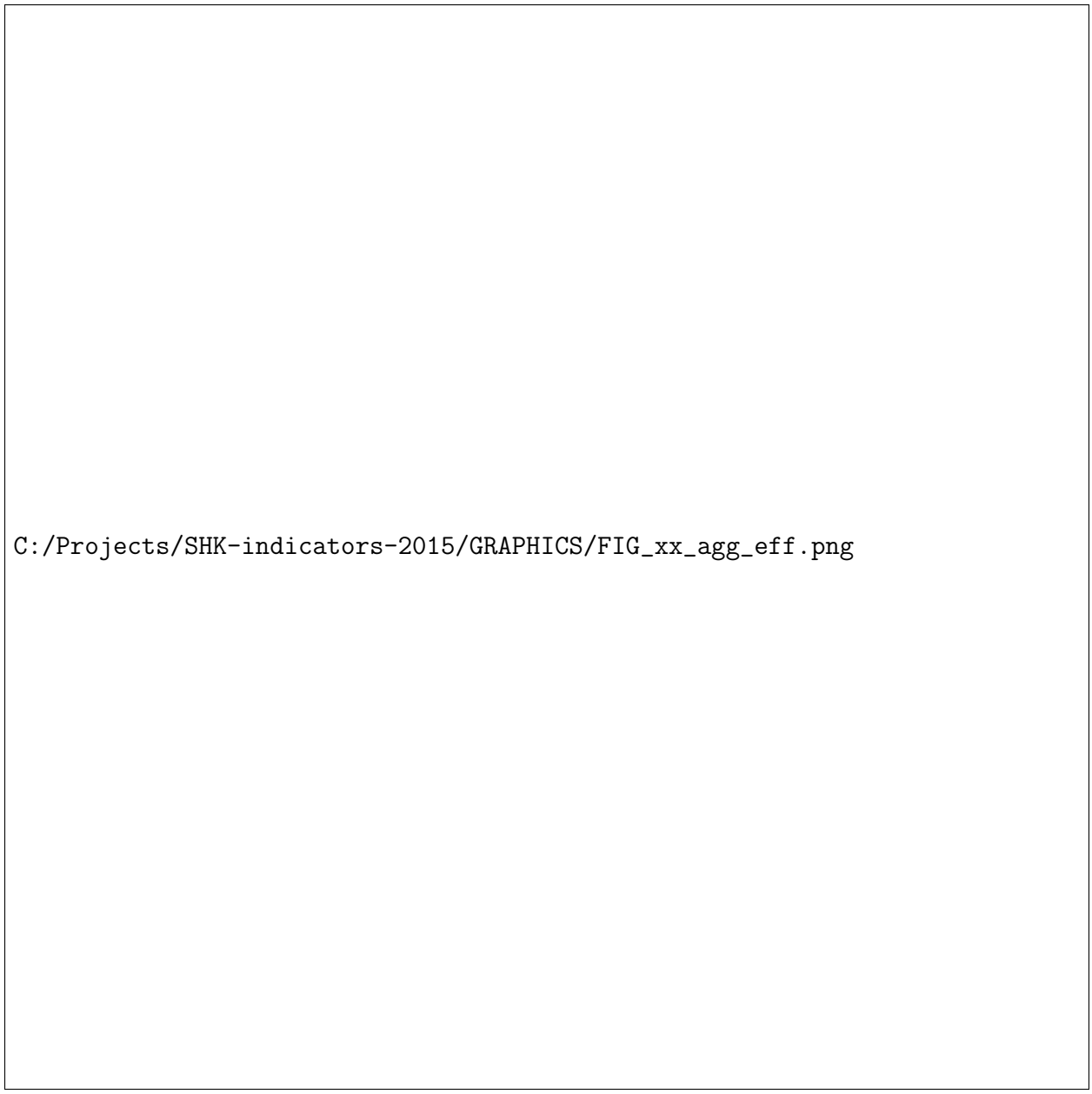


Figure 8: Aggregate effort by region.

Fishing Effort- Purse Seine

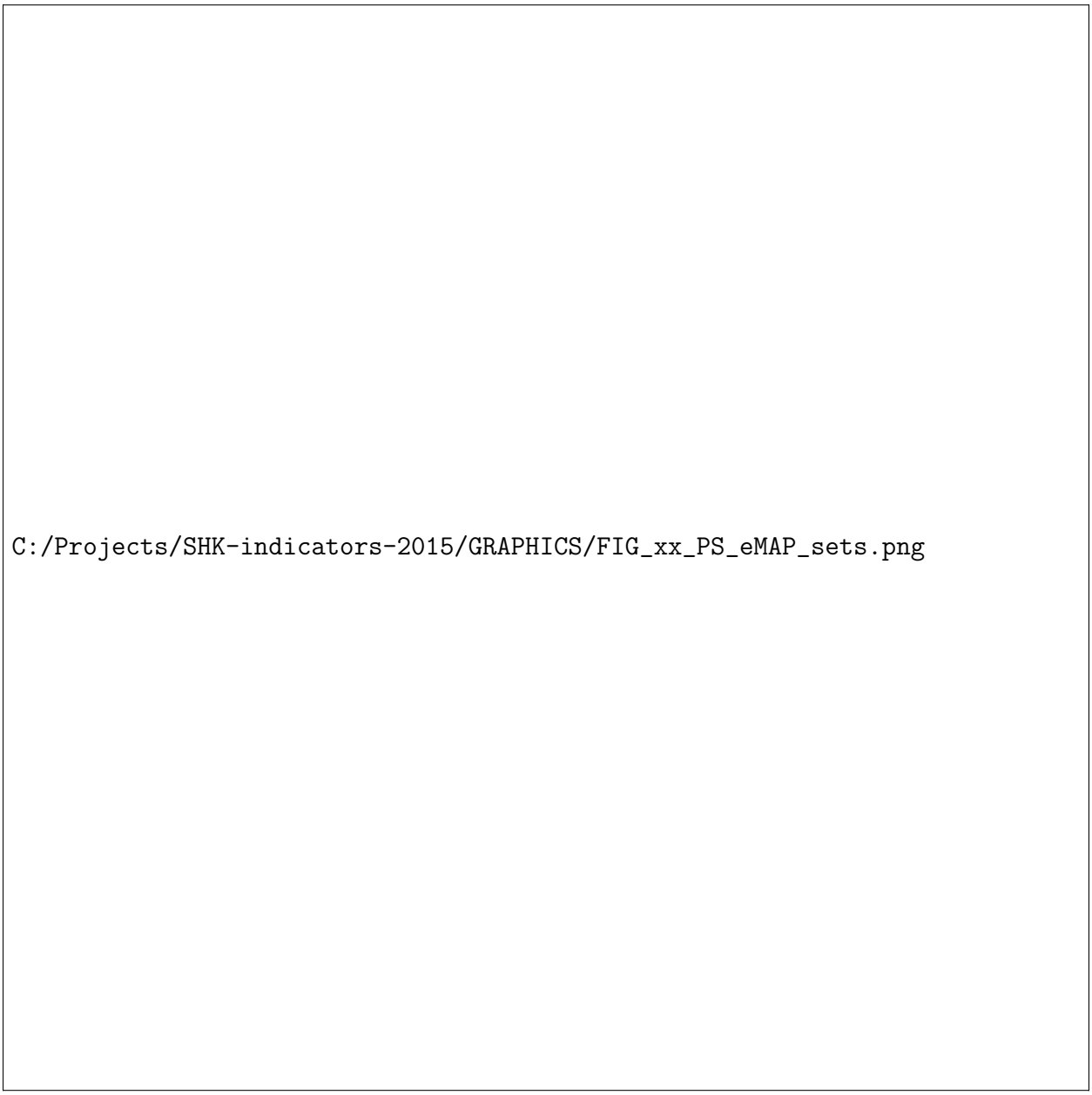


Figure 9: Observed purse seine in the WCPO showing the top four fishing nations and all others combined.

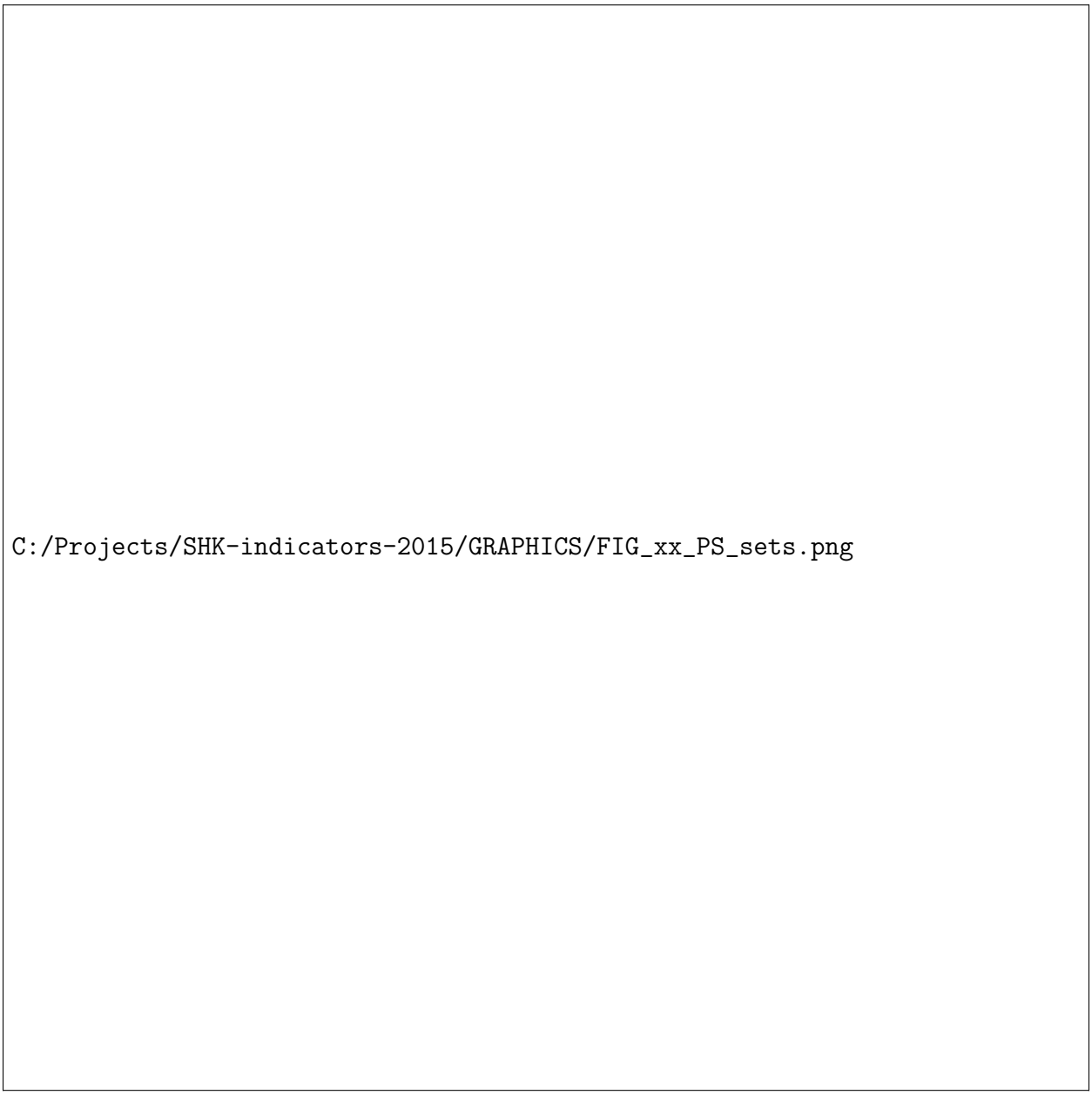


Figure 10: Absolute percent difference in effort between reported (logsheet) effort and observed effort.

1 Distribution Indicator Analyses

1.1 Introduction

1.2 Methods

1.3 Results

1.3.1 Blue Shark

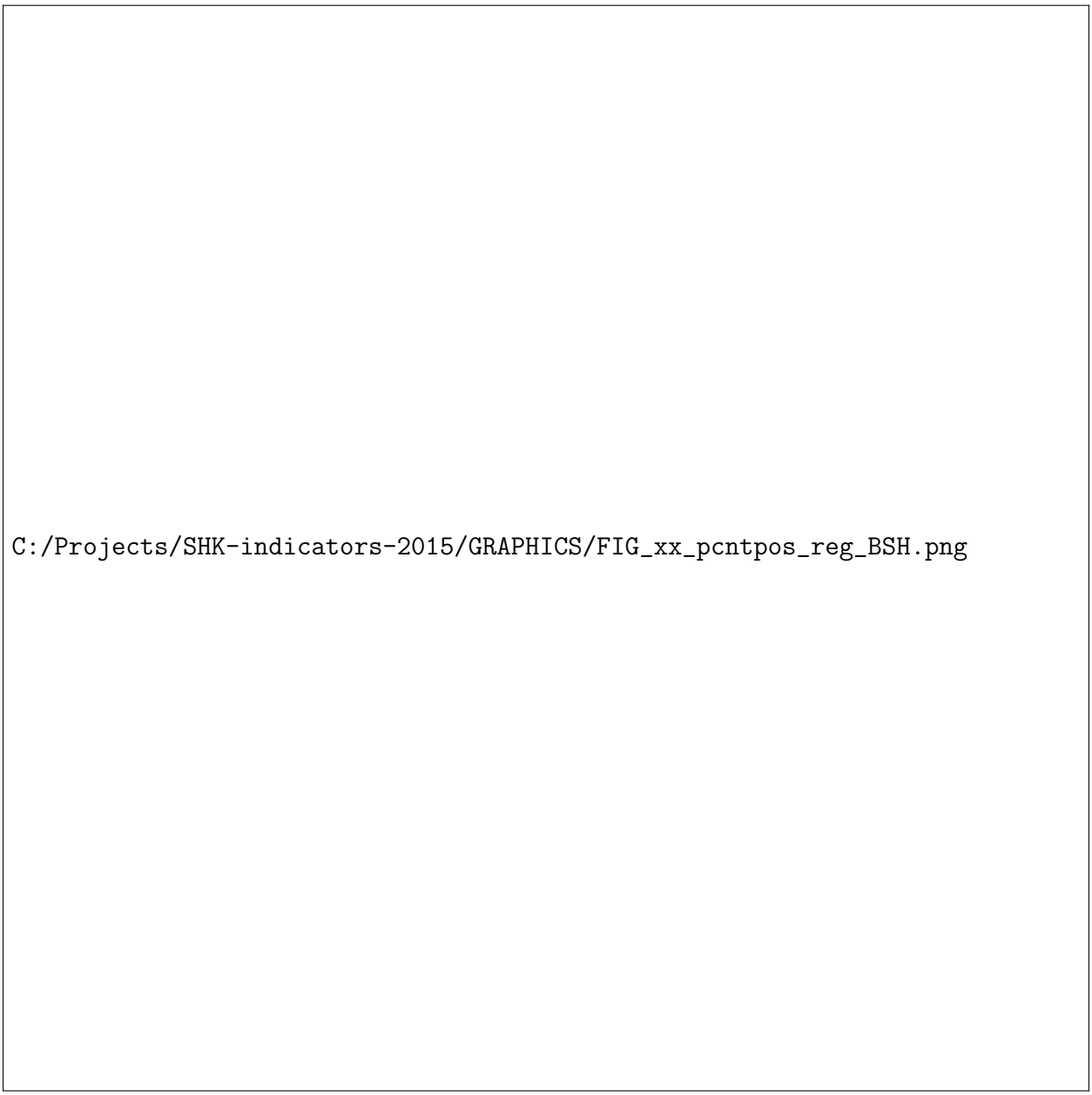


Figure 11: Blue shark distribution indicators. Proportion of positive sets, observer data.

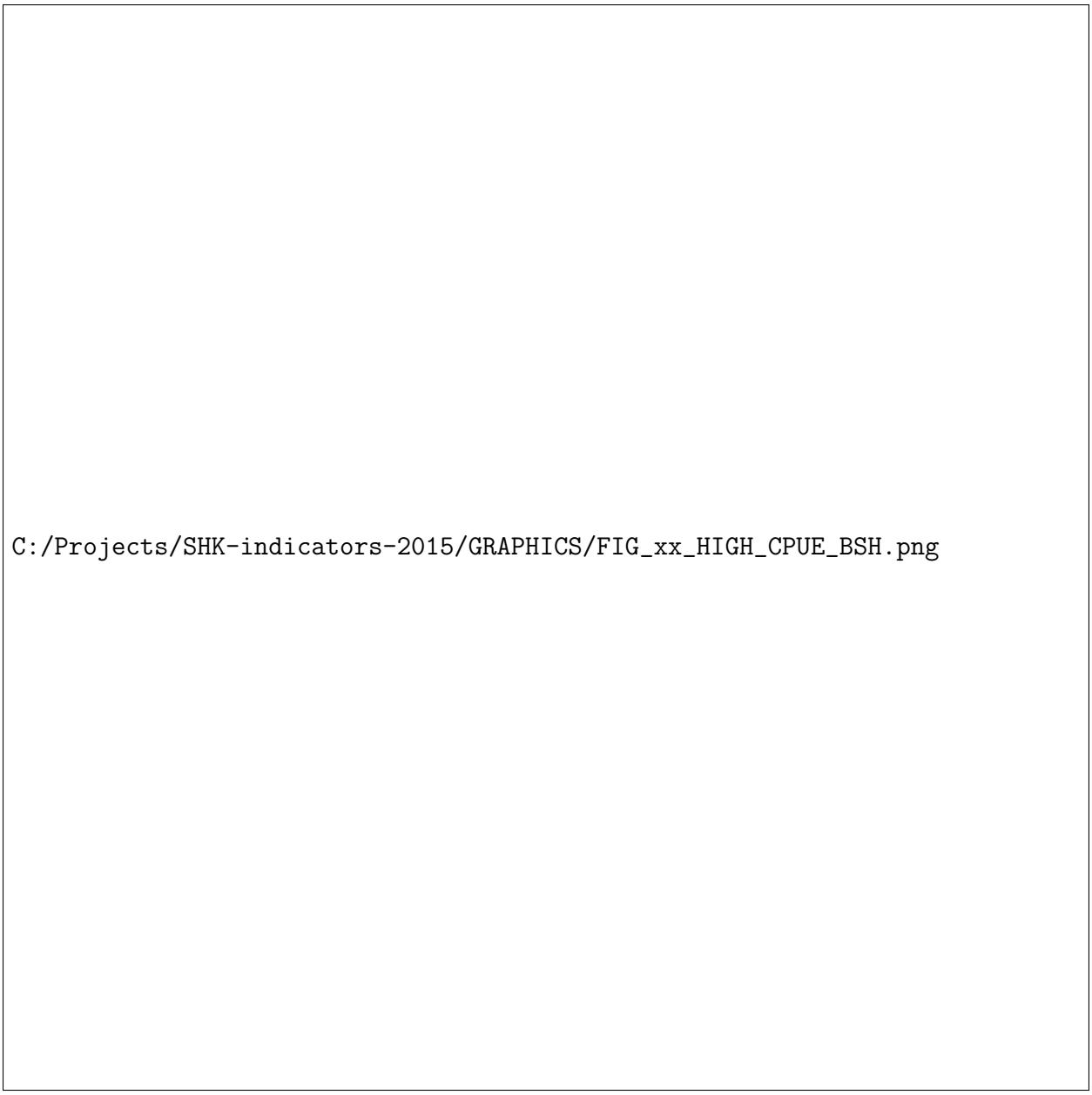


Figure 12: Blue shark distribution indicators. Proportion of 5 degree squares having CPUE greater than 1 per 1000 hooks region, observer data.

1.3.2 Mako Shark

1.3.3 Silky Shark

1.3.4 Oceanic Whitetip Shark

1.3.5 Thresher Shark

1.4 Conclusions

2 Observed Species Composition Indicator Analyses

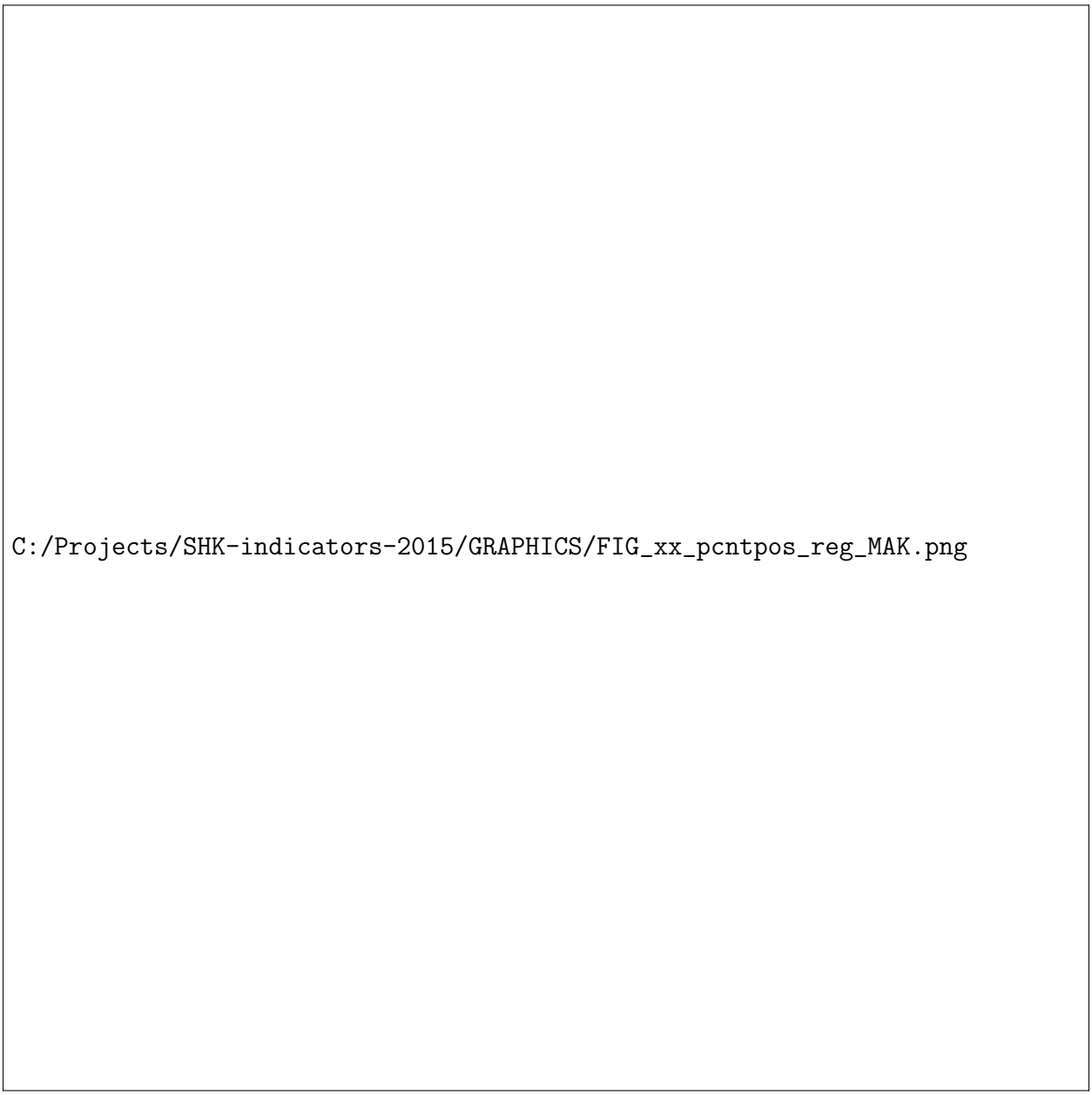


Figure 13: Mako shark distribution indicators. Proportion of positive sets, observer data.

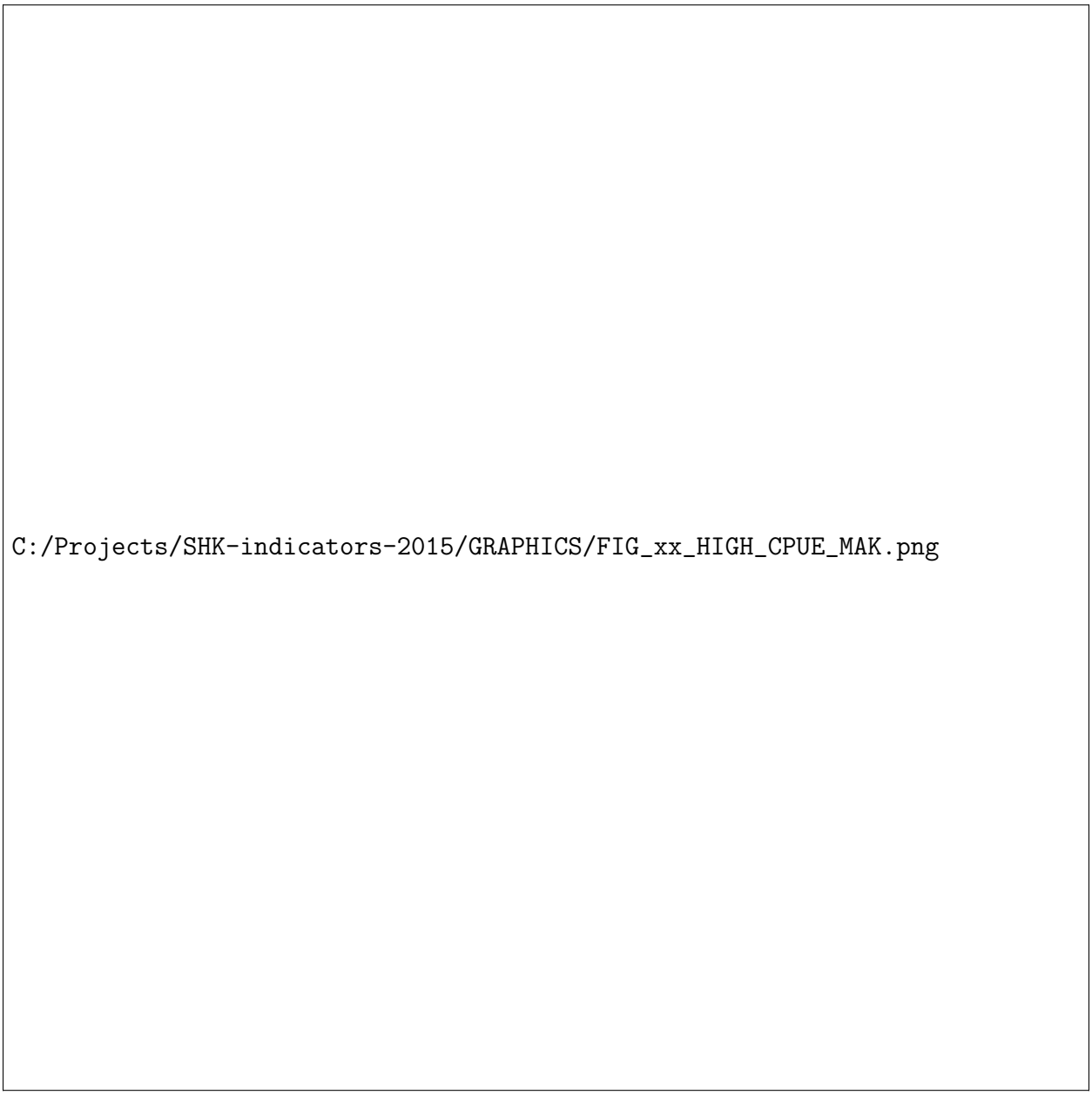


Figure 14: Mako shark distribution indicators. Proportion of 5 degree squares having CPUE greater than 1 per 1000 hooks region, observer data.

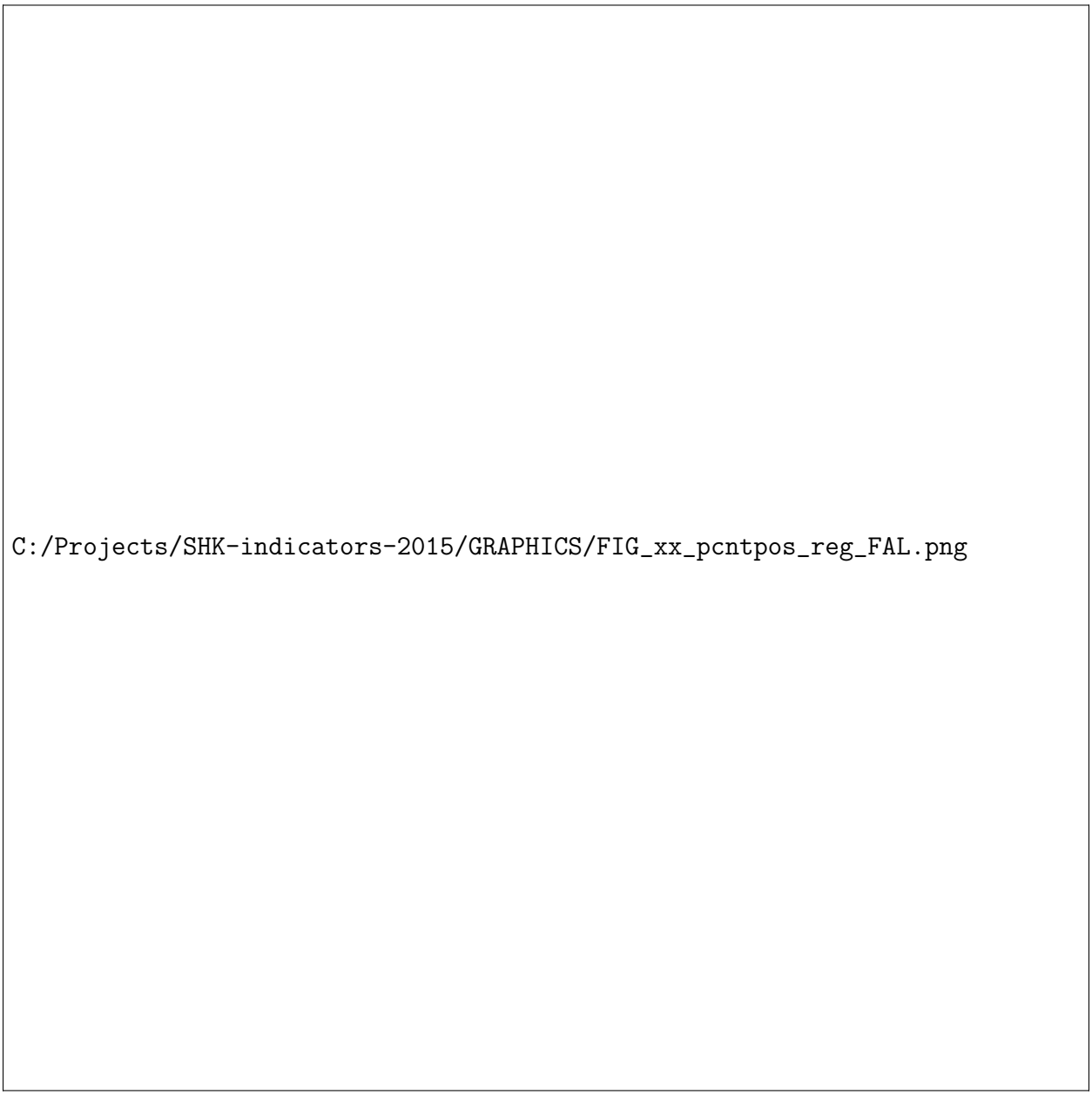


Figure 15: Mako shark distribution indicators. Proportion of positive sets, observer data.

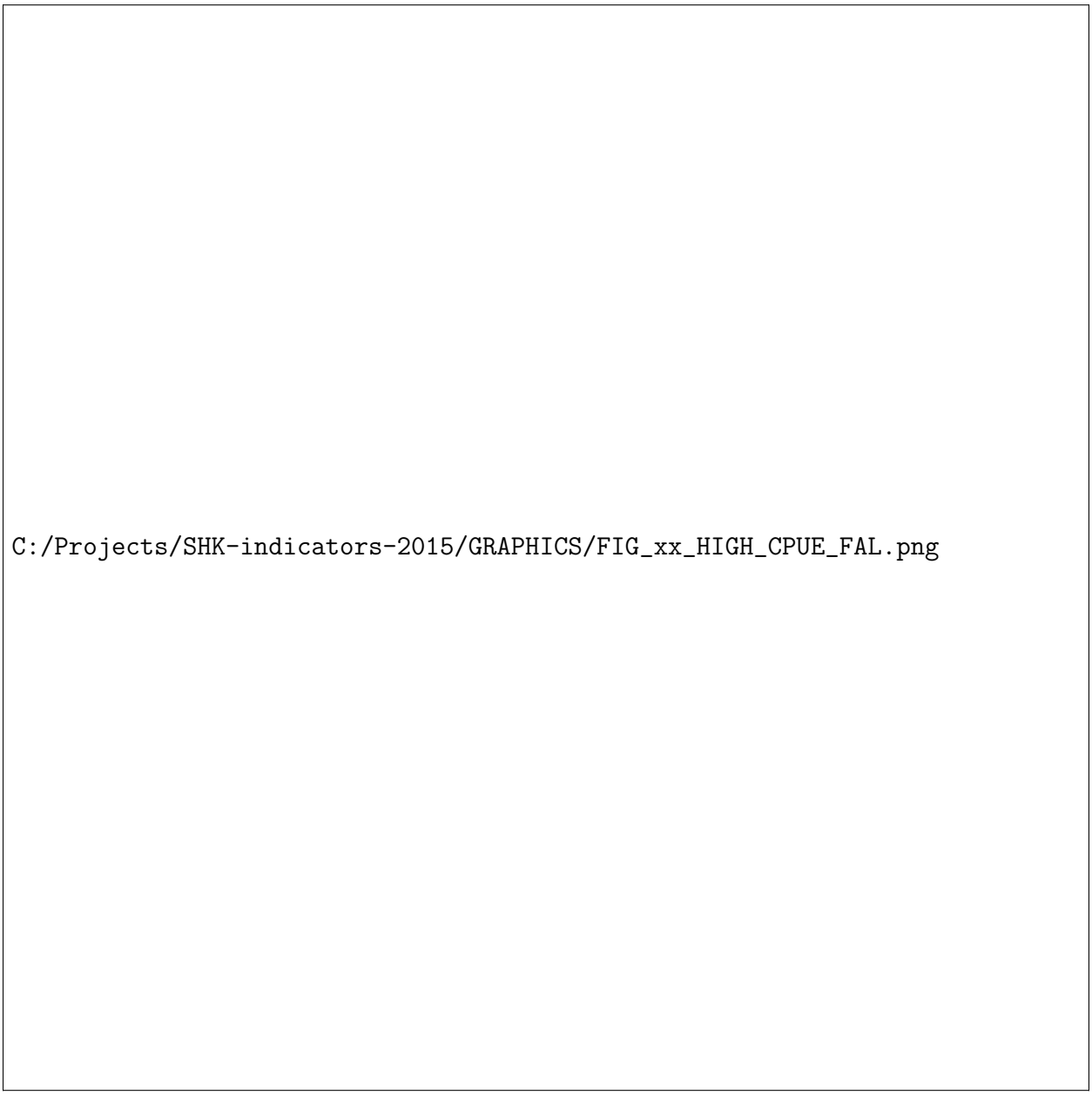


Figure 16: Silky shark distribution indicators. Proportion of 5 degree squares having CPUE greater than 1 per 1000 hooks region, observer data.

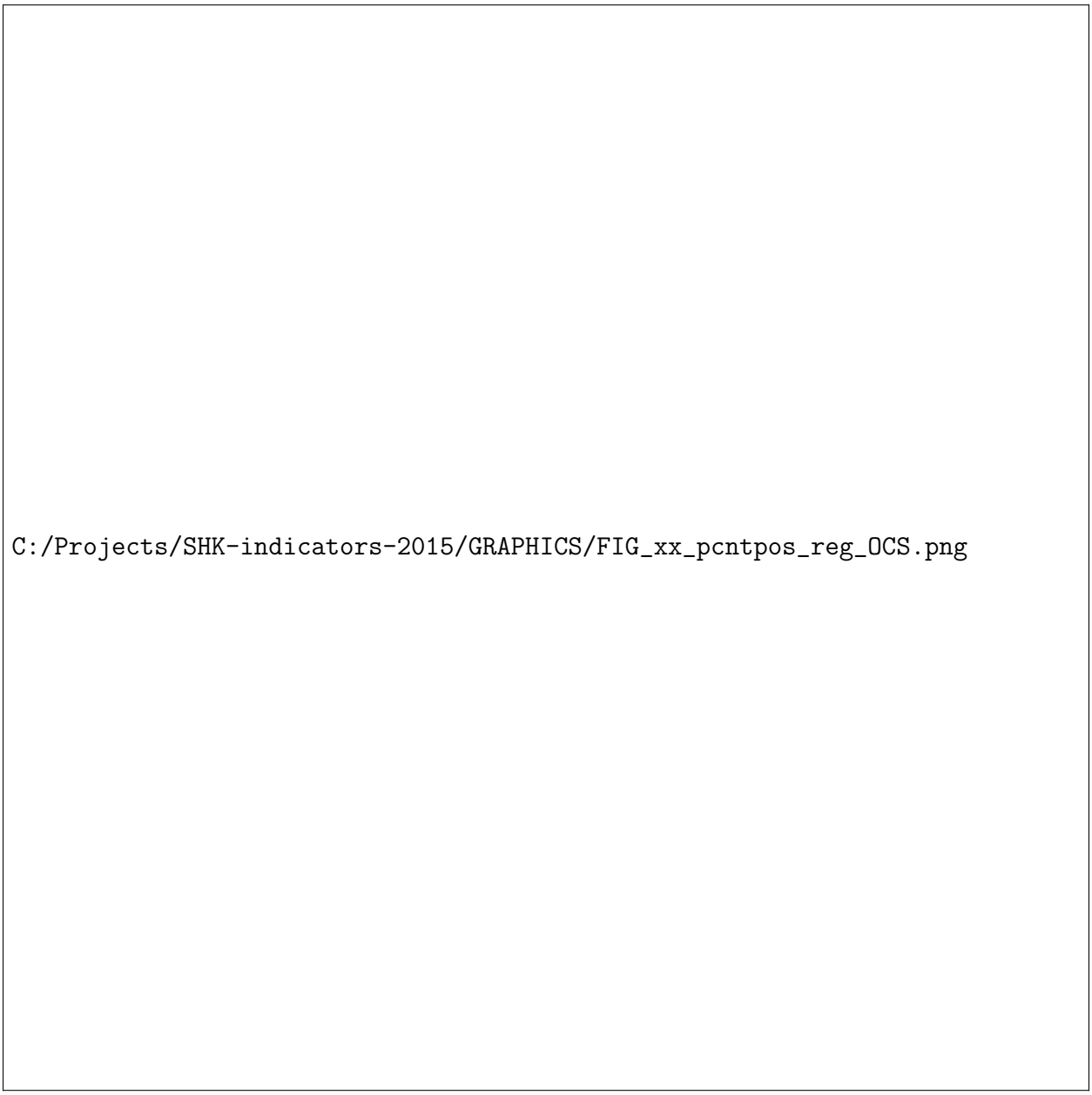


Figure 17: Oceanic whitetip shark distribution indicators. Proportion of positive sets, observer data.

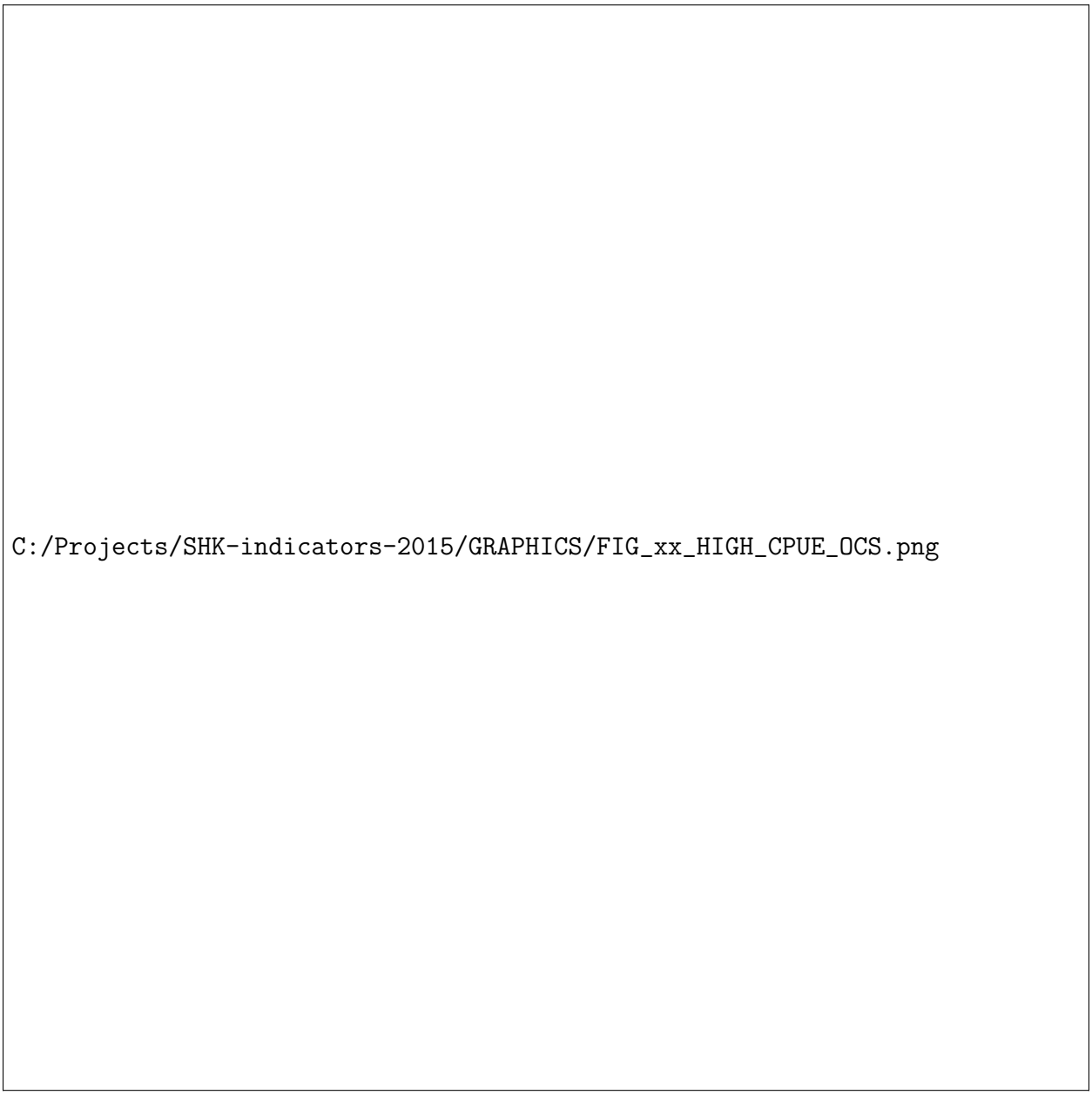


Figure 18: Oceanic whitetip shark distribution indicators. Proportion of 5 degree squares having CPUE greater than 1 per 1000 hooks region, observer data.

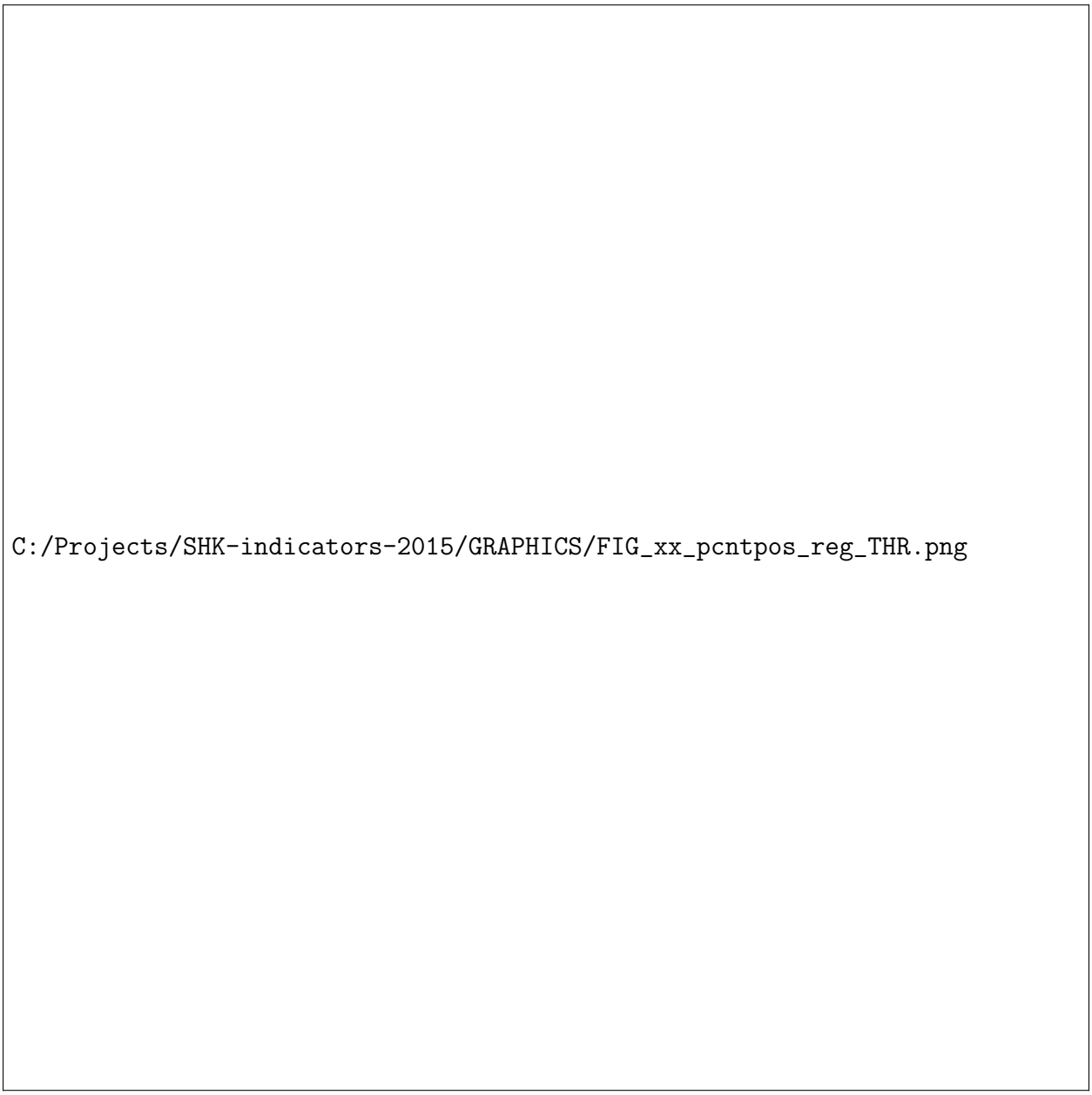


Figure 19: Thresher shark distribution indicators. Proportion of positive sets, observer data.

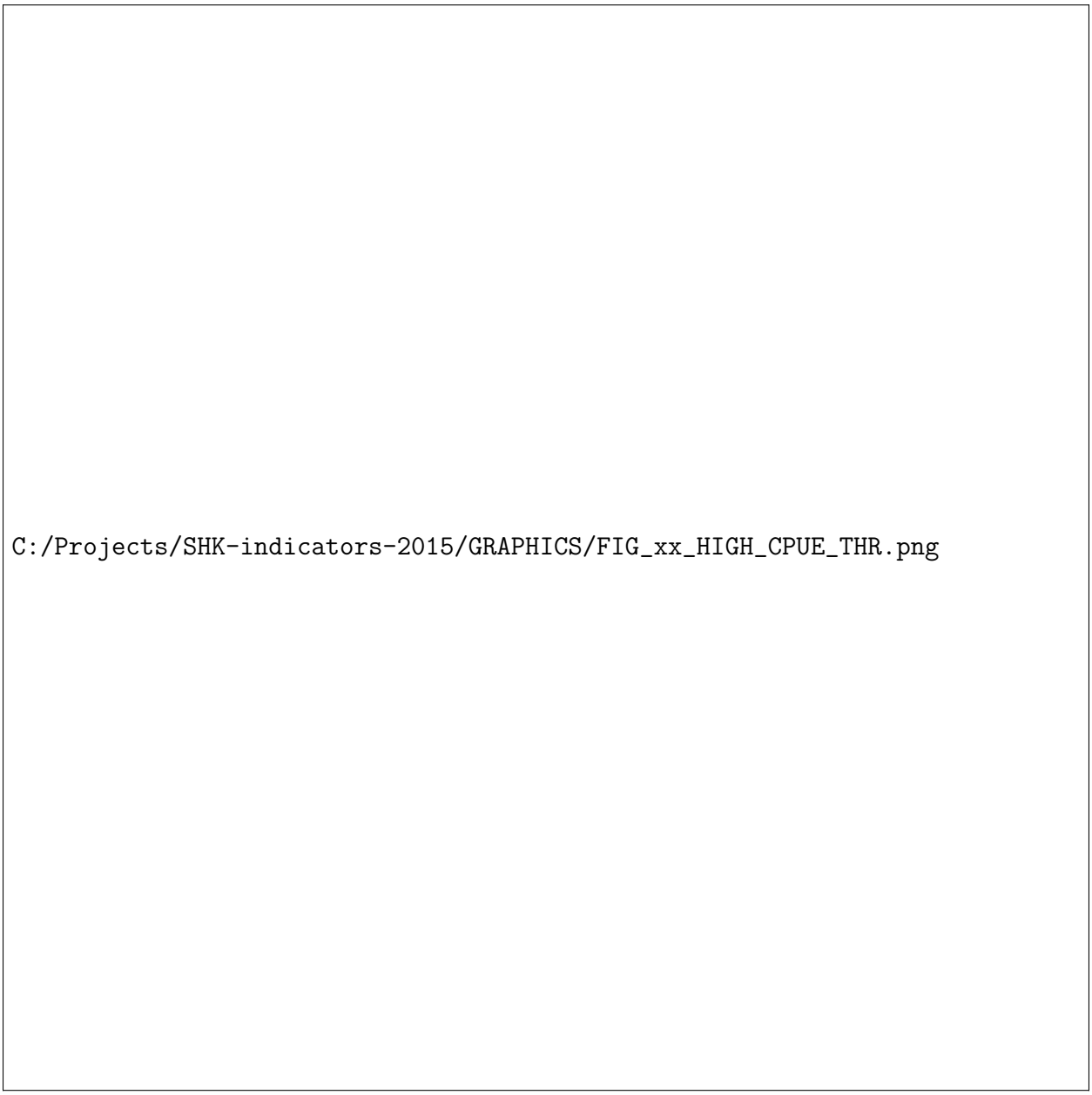


Figure 20: Thresher shark distribution indicators. Proportion of 5 degree squares having CPUE greater than 1 per 1000 hooks region, observer data.

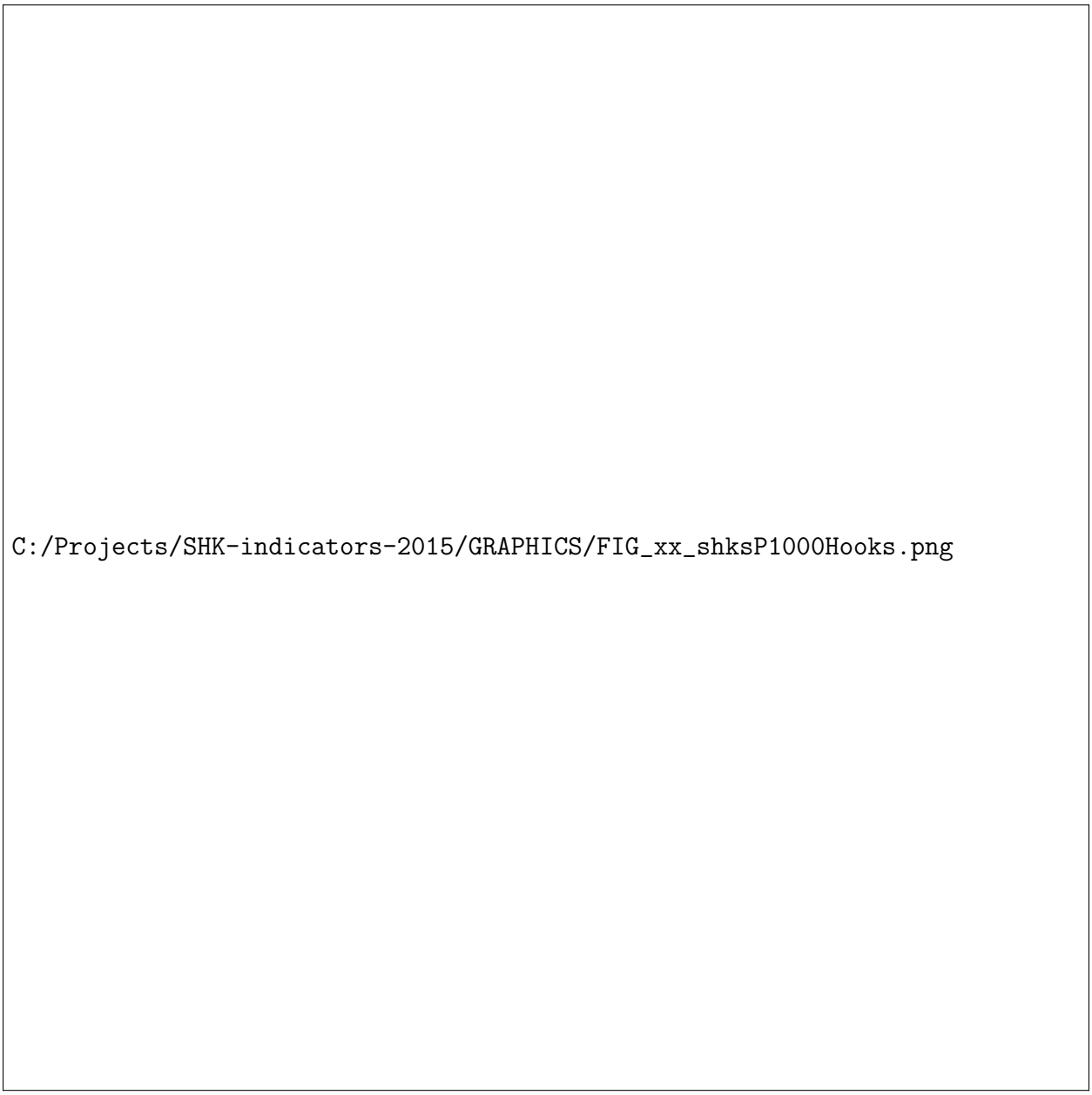


Figure 21: Catch Composition Indicators. Sharks Per. 1000 hooks by region, observer data.

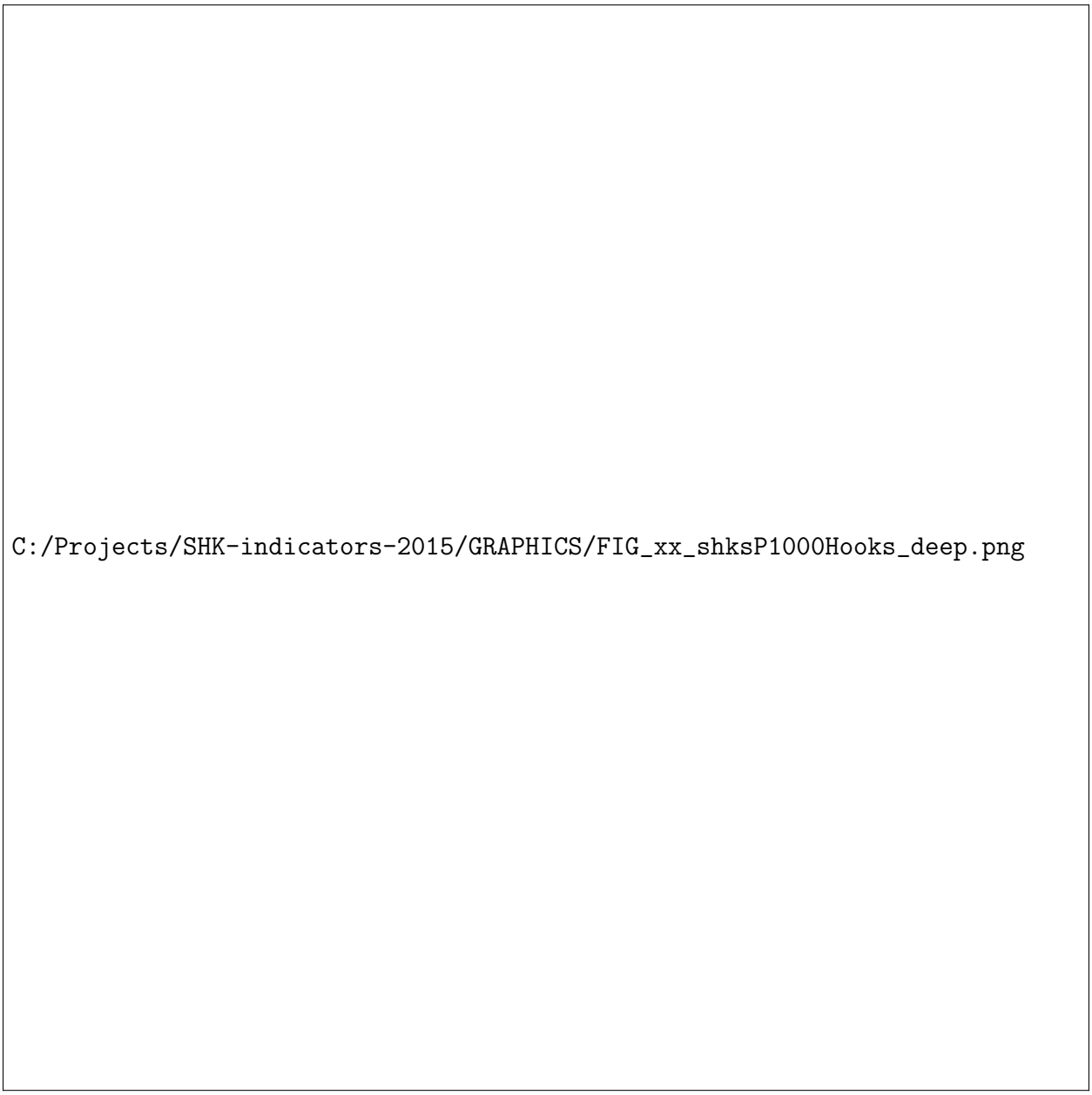


Figure 22: Catch Composition Indicators. Sharks Per. 1000 hooks by region, deep sets observer data.

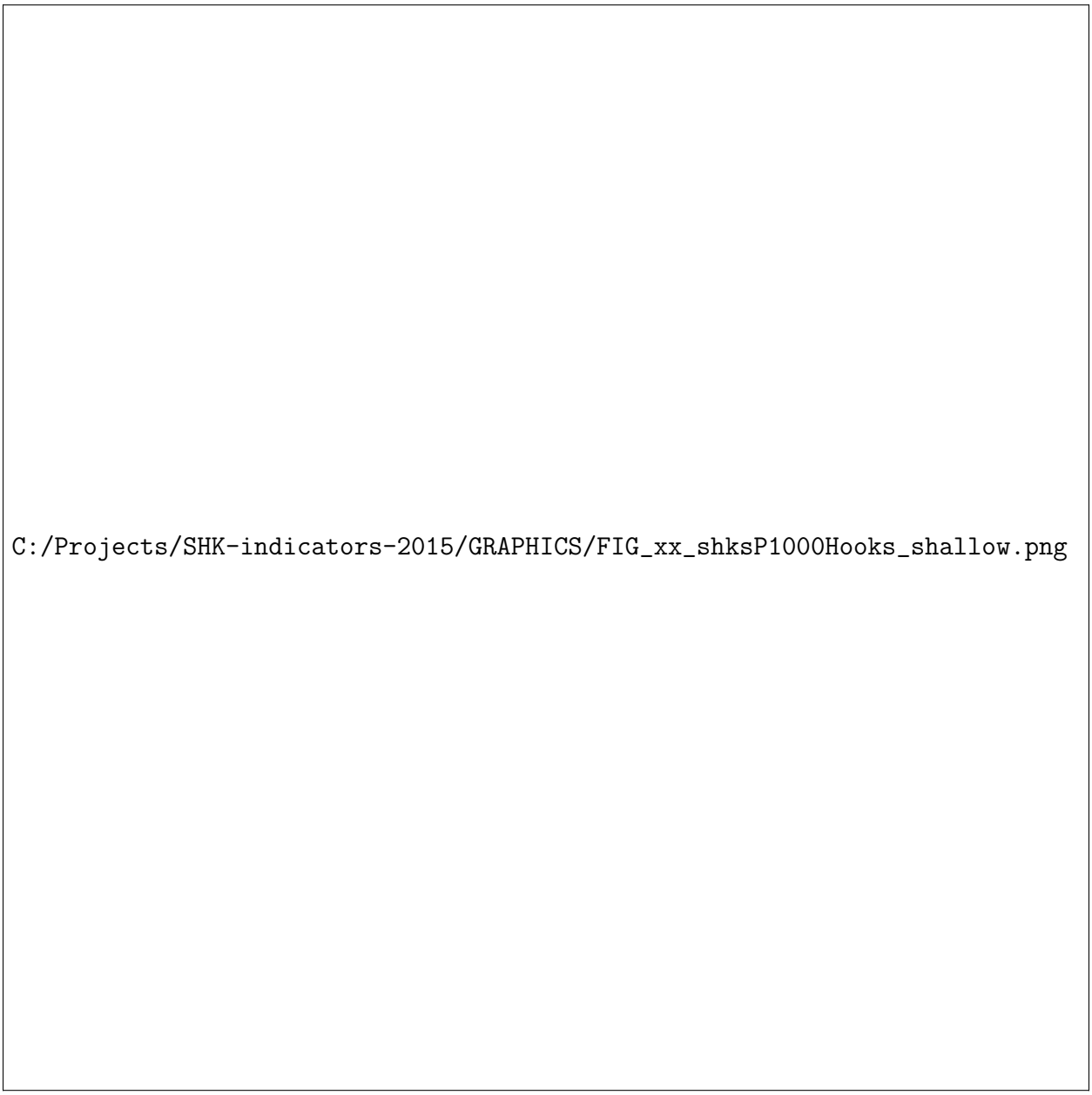


Figure 23: Catch Composition Indicators. Sharks Per. 1000 hooks by region, shallow sets observer data.

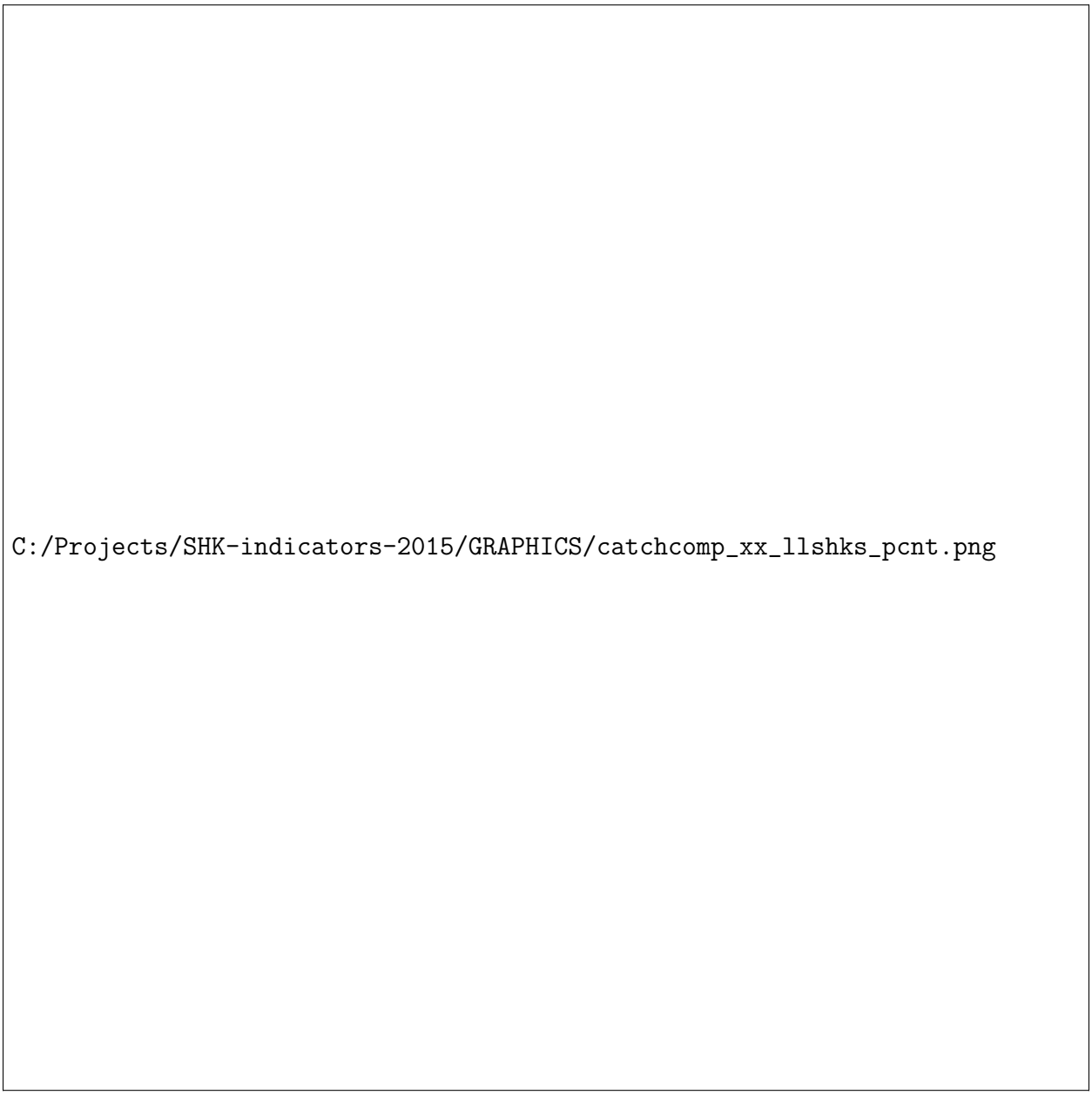


Figure 24: Catch Composition Indicators. Proportional catch of main species and other sharks by retions.

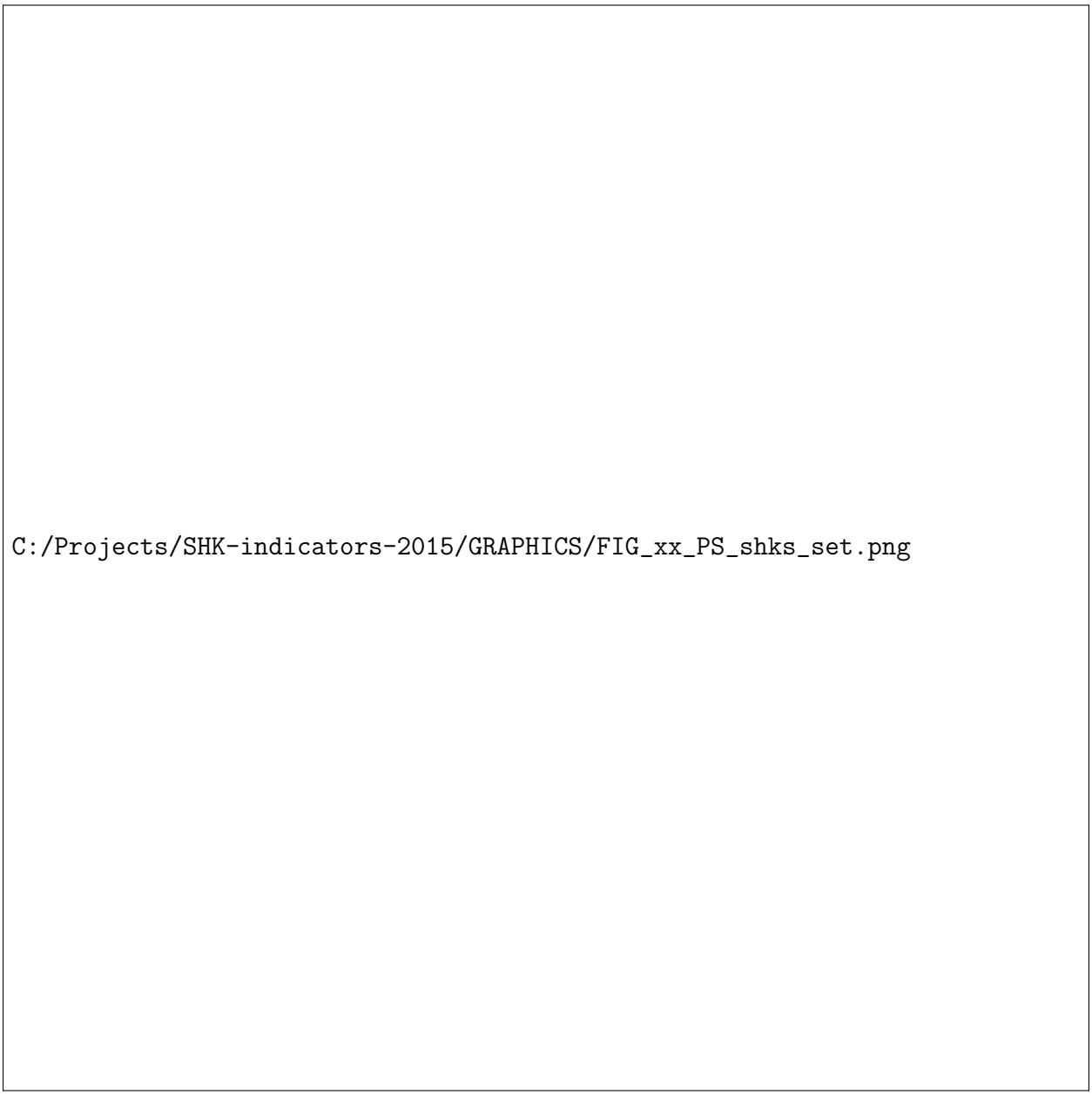


Figure 25: Catch Composition Indicators. Sharks per set, observer data.

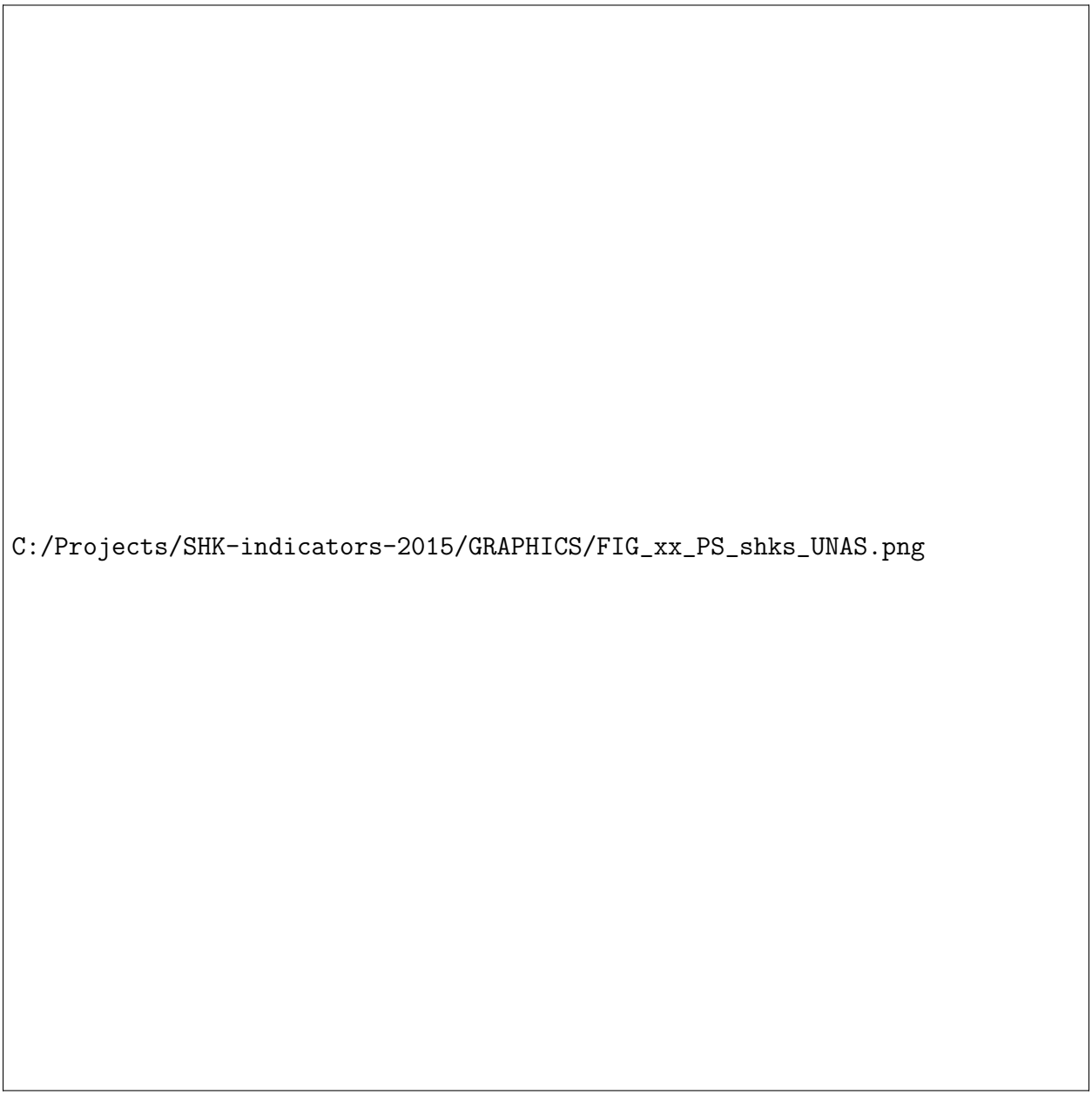


Figure 26: Catch Composition Indicators. Sharks per set, associated sets, observer data

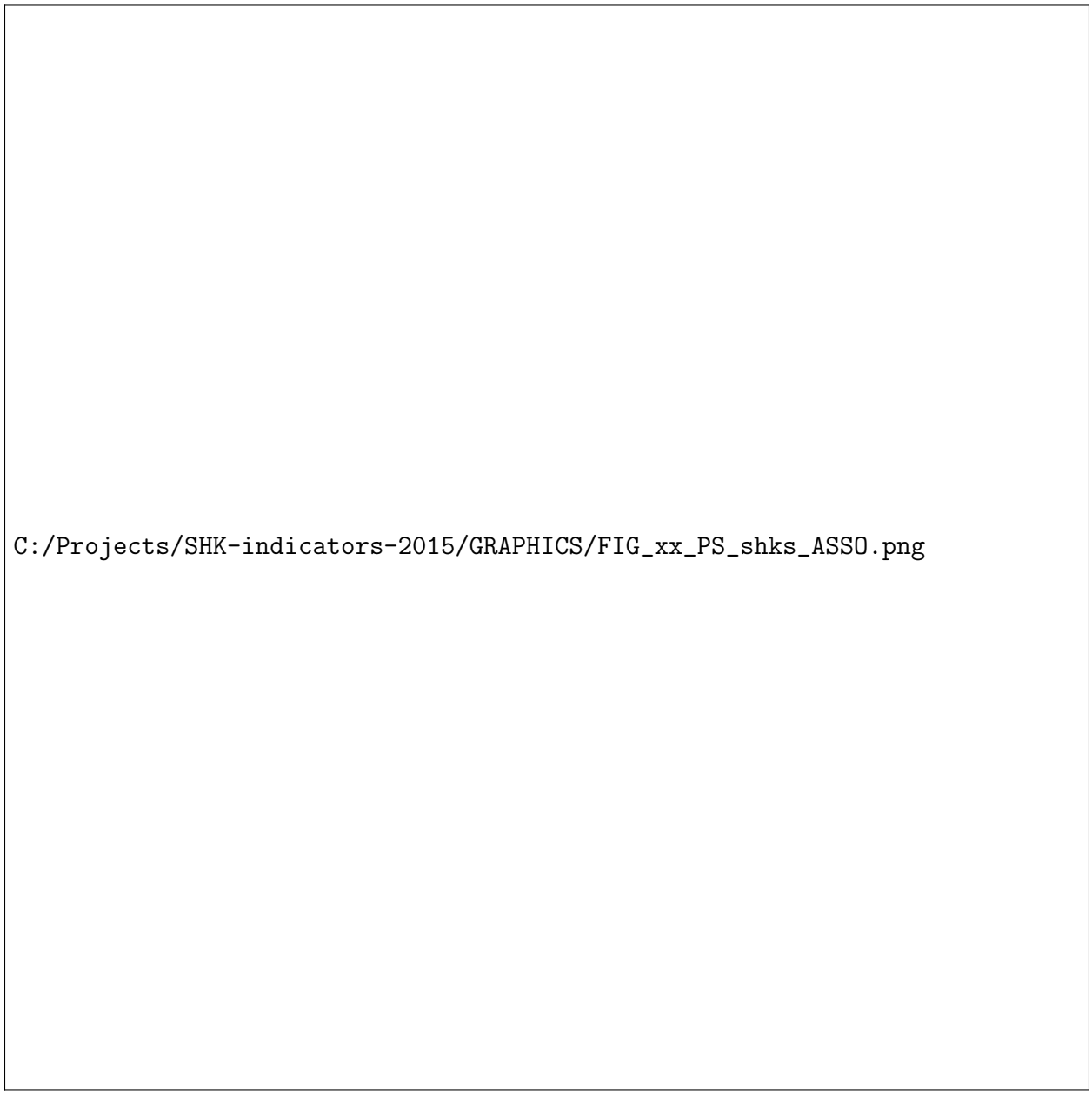


Figure 27: Catch Composition Indicators. Sharks per set, unassociated sets, observer data.

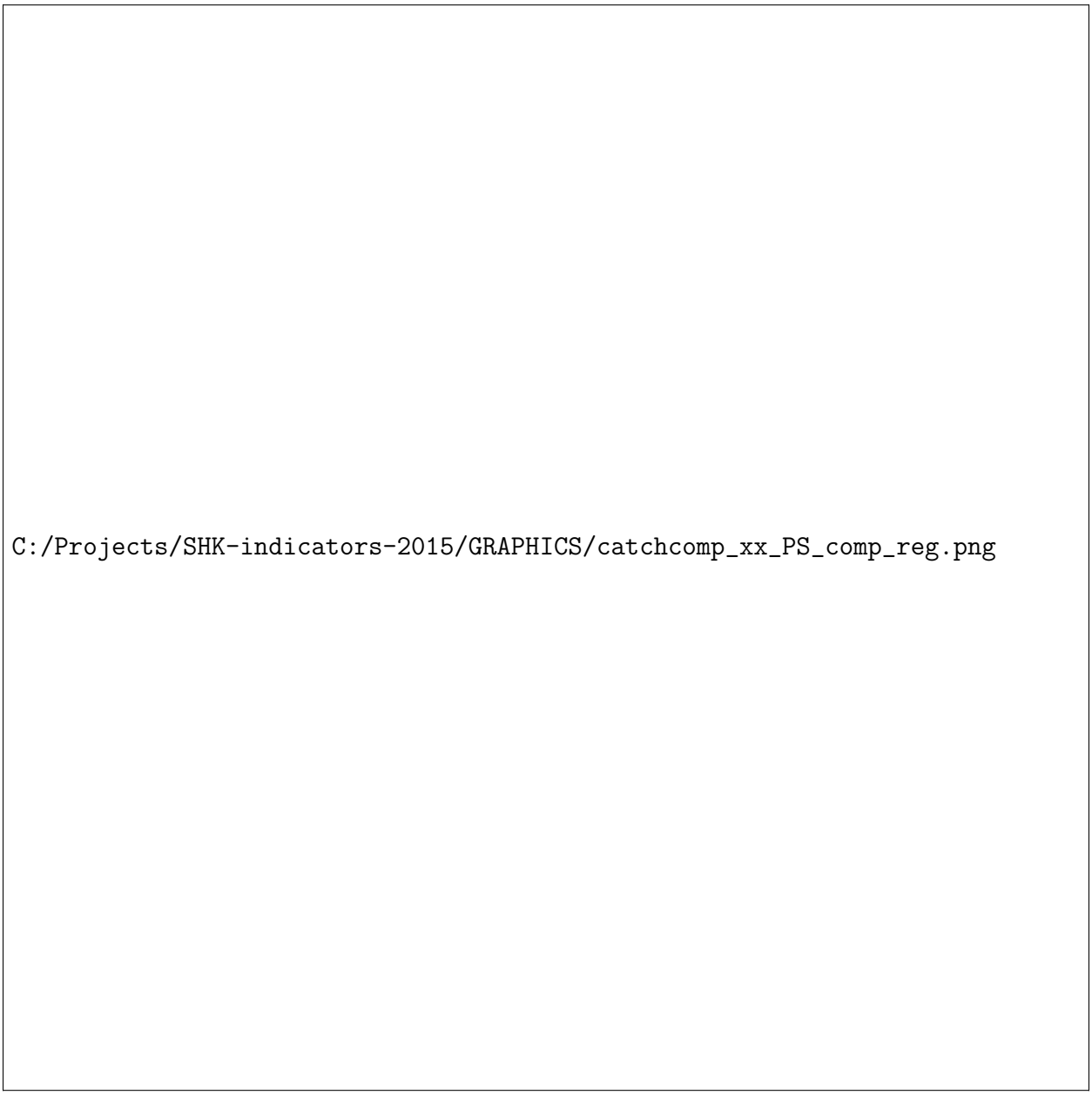


Figure 28: Catch Composition Indicators. Catch composition by proportion , observer data.

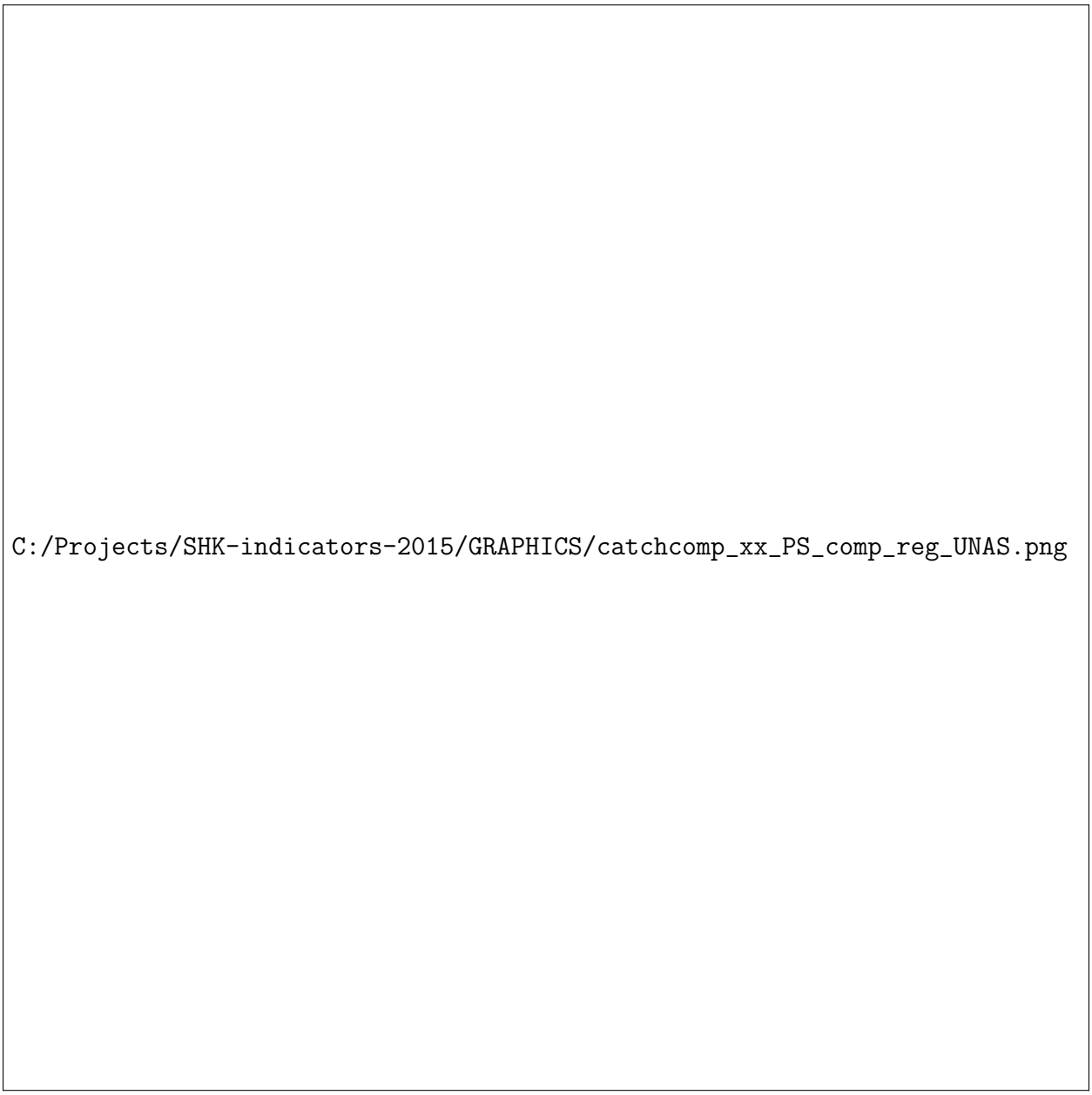


Figure 29: Catch Composition Indicators. Catch composition by proportion, associated sets, observer data

3 Catch Per Unit Effort indicator analyses

Purse Seine data preparation

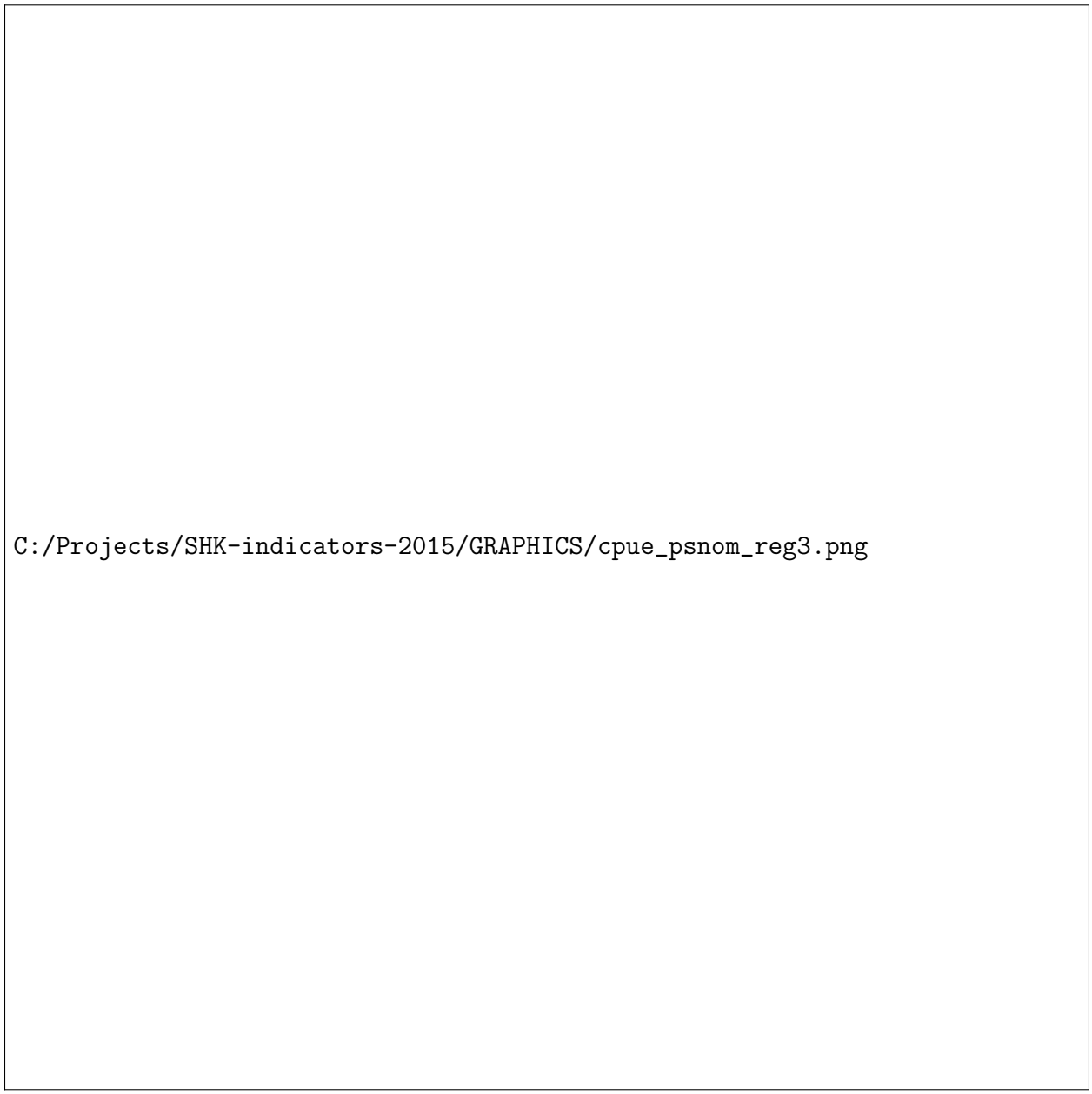


Figure 31: CPUE indicators, nominal CPUE in the purse seine fishery, all sets, Region 3.

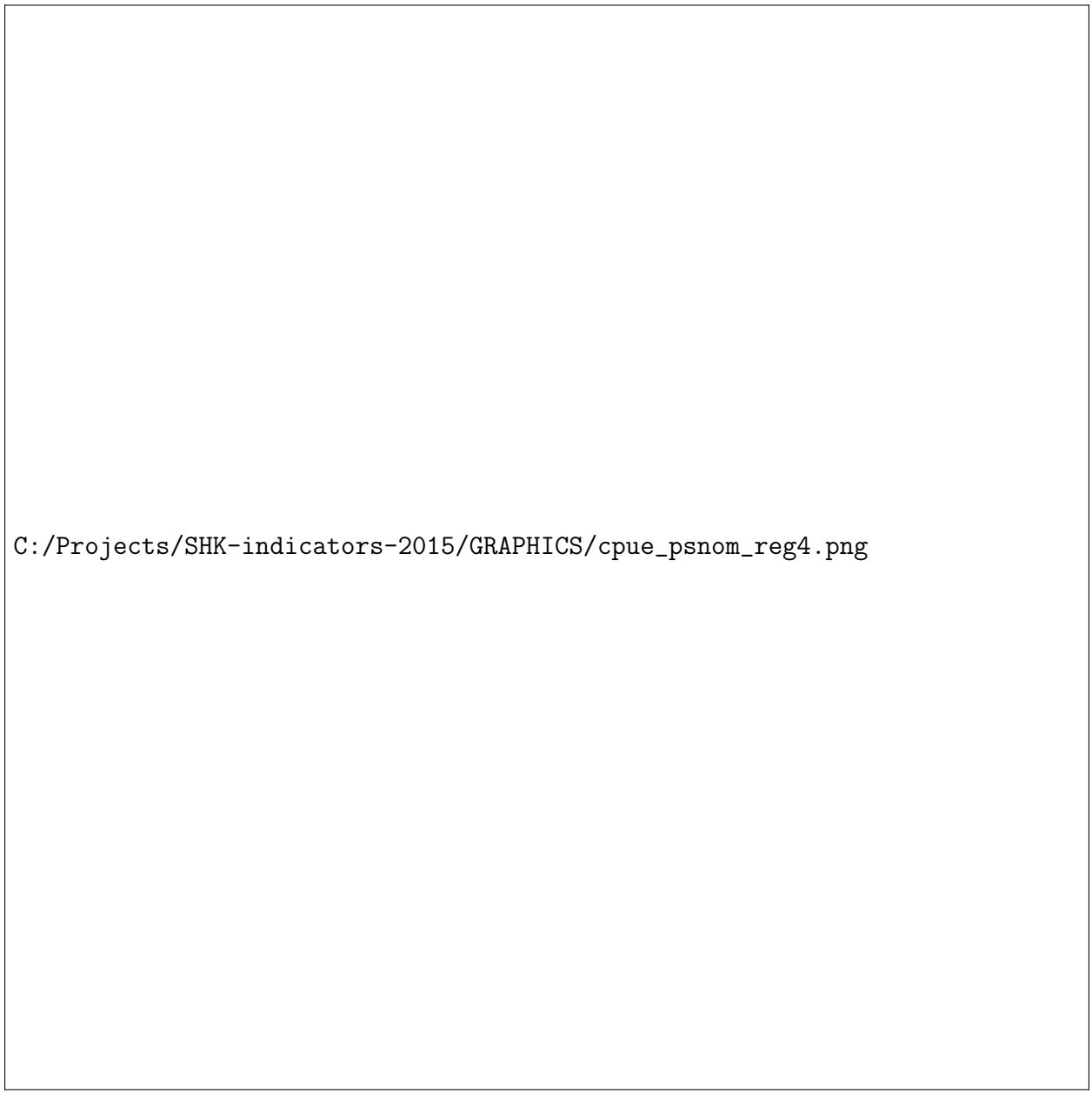


Figure 32: CPUE indicators, nominal CPUE in the purse seine fishery, all sets, Region 4.

3.1 Results

3.1.1 Blue Shark

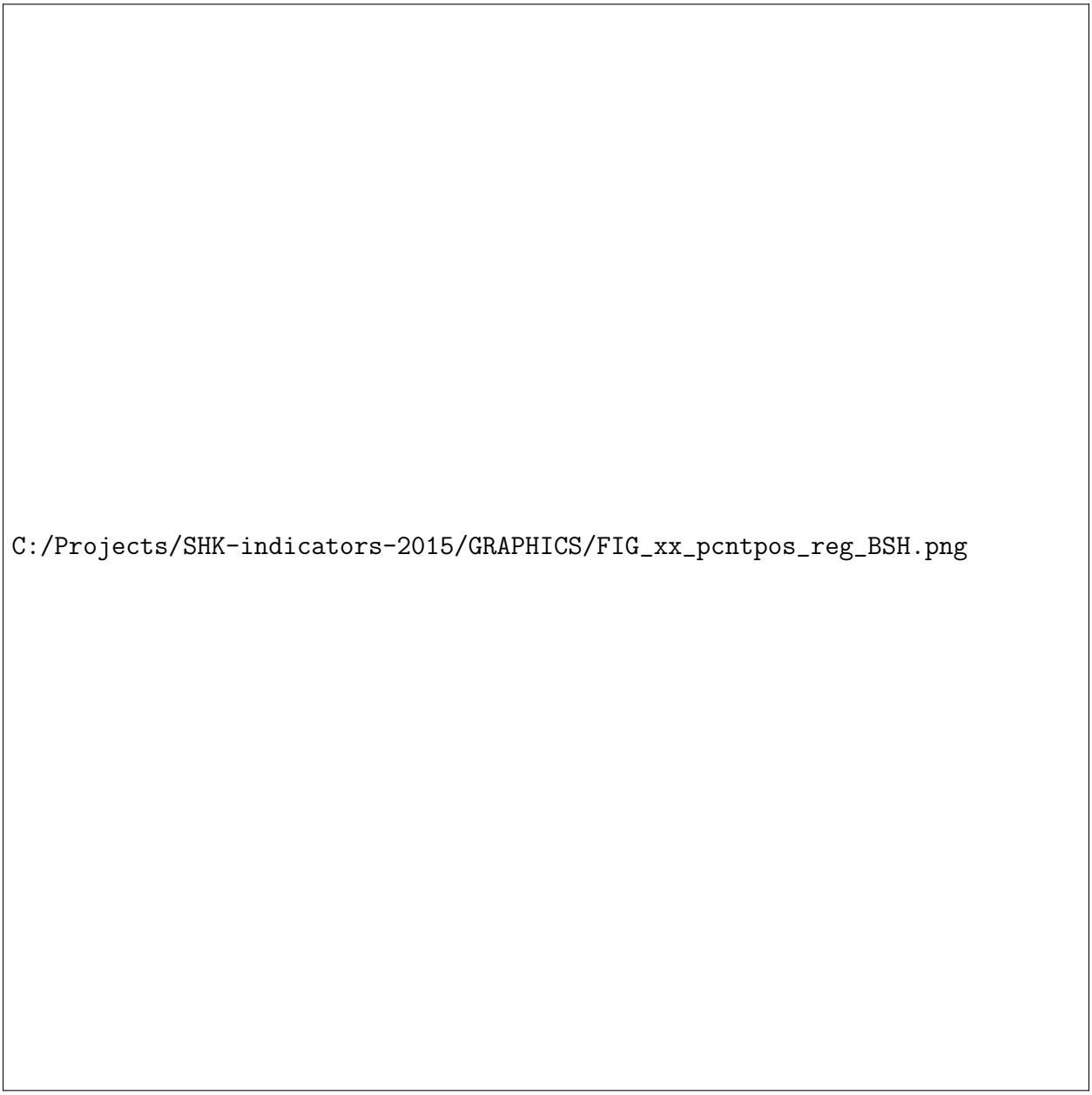


Figure 33: Blue shark CPUE indicators. Proportion of positive sets, observer data.

3.1.2 Mako Shark

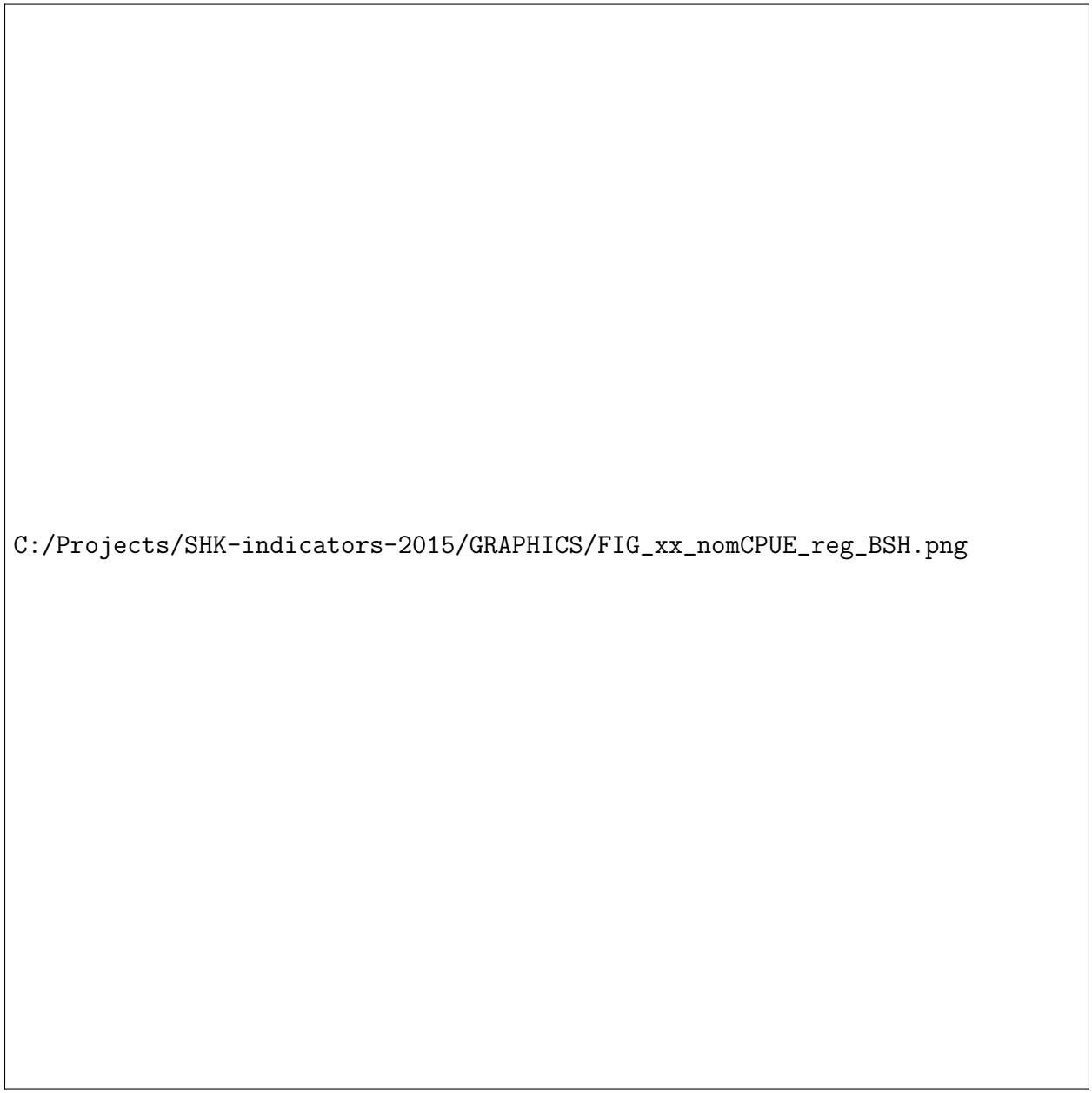


Figure 34: Blue shark CPUE indicators. Nominal CPUE, sharks per 1000 hooks, observer data.

Figure 35: Blue shark CPUE indicators. Standardized blue shark CPUE based on the negative binomial model for observer data in the northern hemisphere.

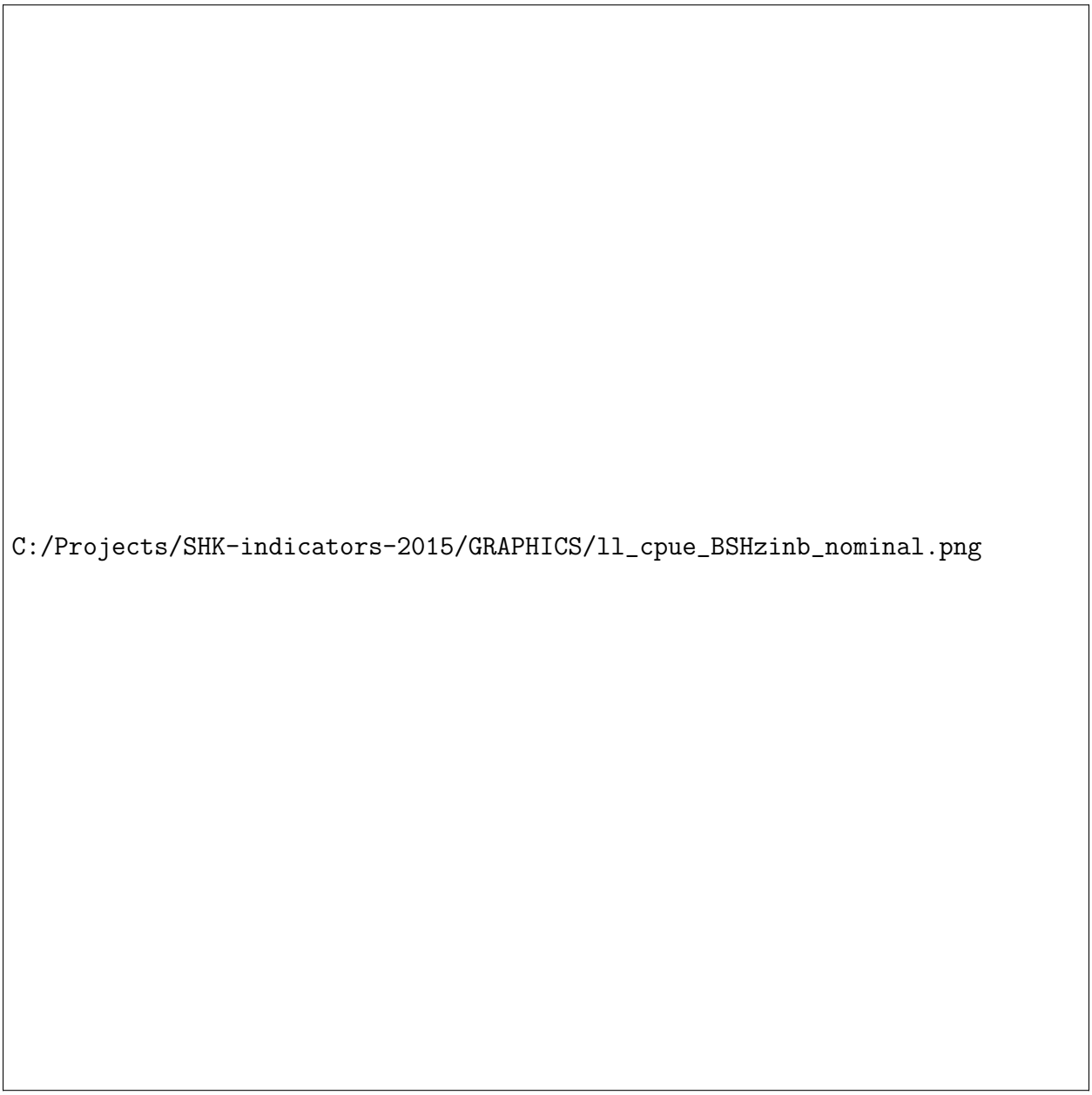


Figure 36: Blue shark CPUE indicators. Standardized CPUE, zero inflated negative binomial Southern Hemisphere, observer data.

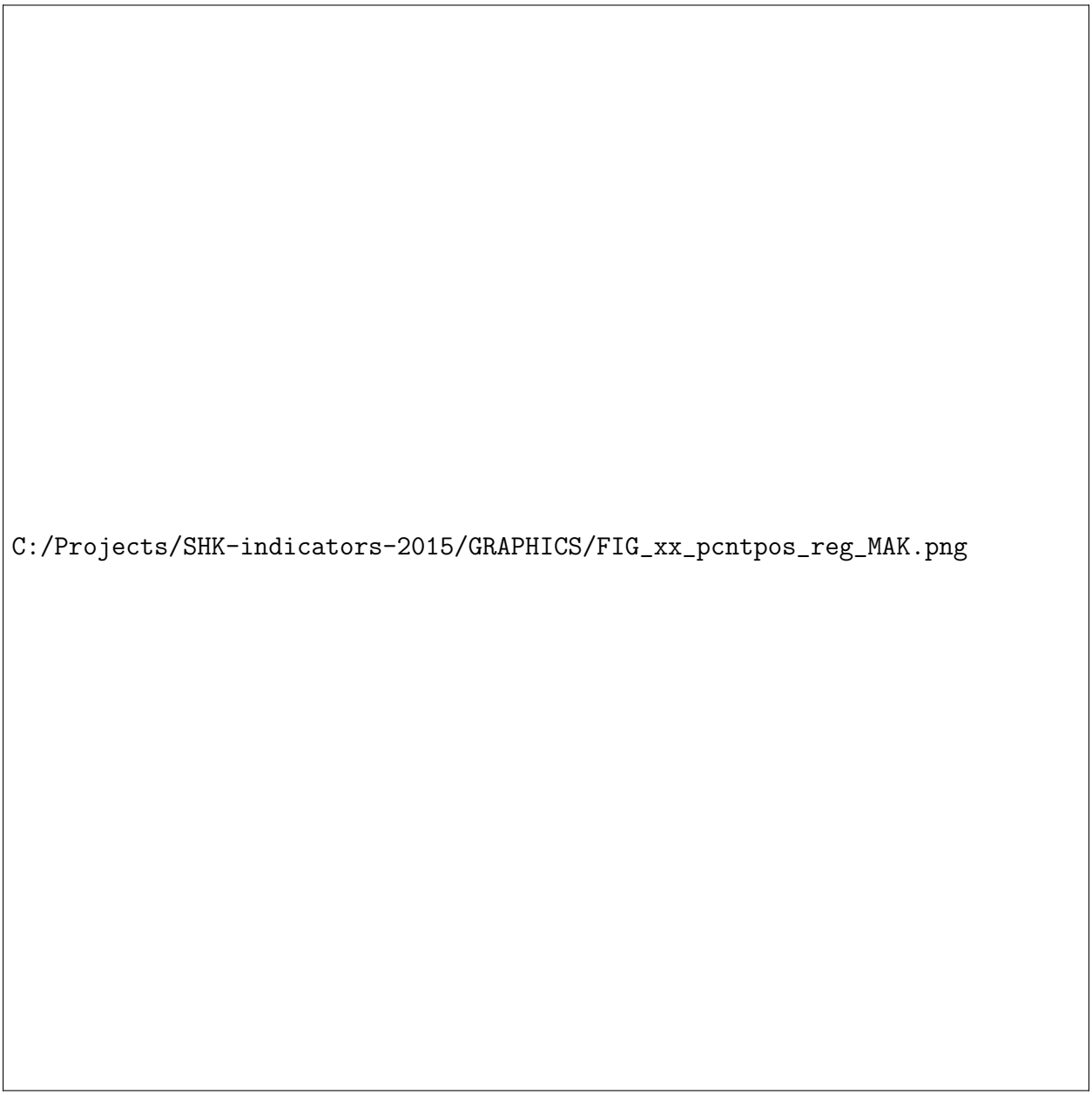


Figure 37: Mako shark CPUE indicators. Proportion of positive sets, observer data.

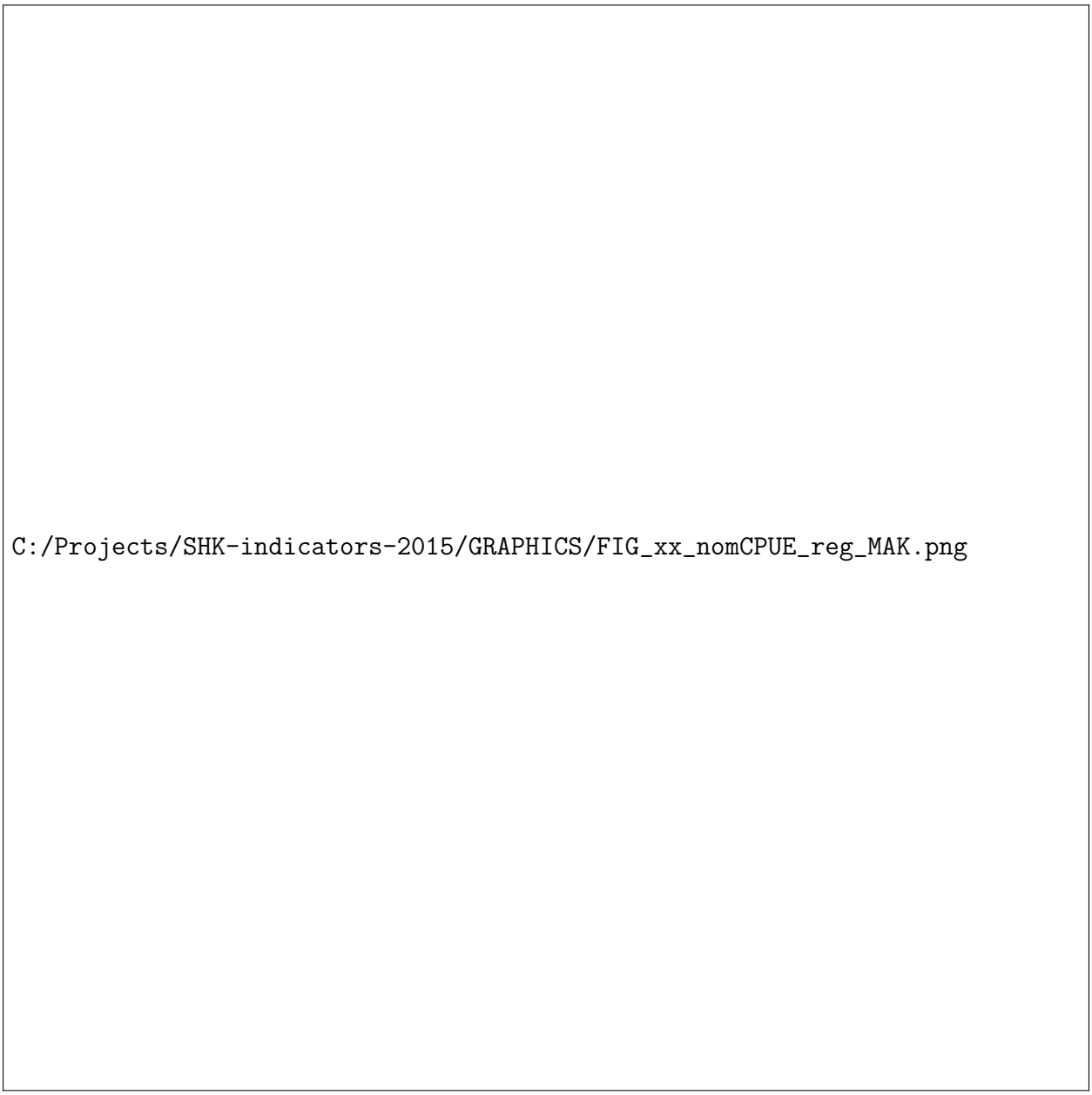


Figure 38: Mako shark CPUE indicators. Nominal CPUE, sharks per 1000 hooks, observer data.

Figure 39: Mako shark CPUE indicators. Standardized CPUE, mako shark in the northern hemisphere.

Figure 40: Mako shark CPUE indicators. Standardized CPUE, mako shark in the southern hemisphere.

3.1.3 Silky Shark

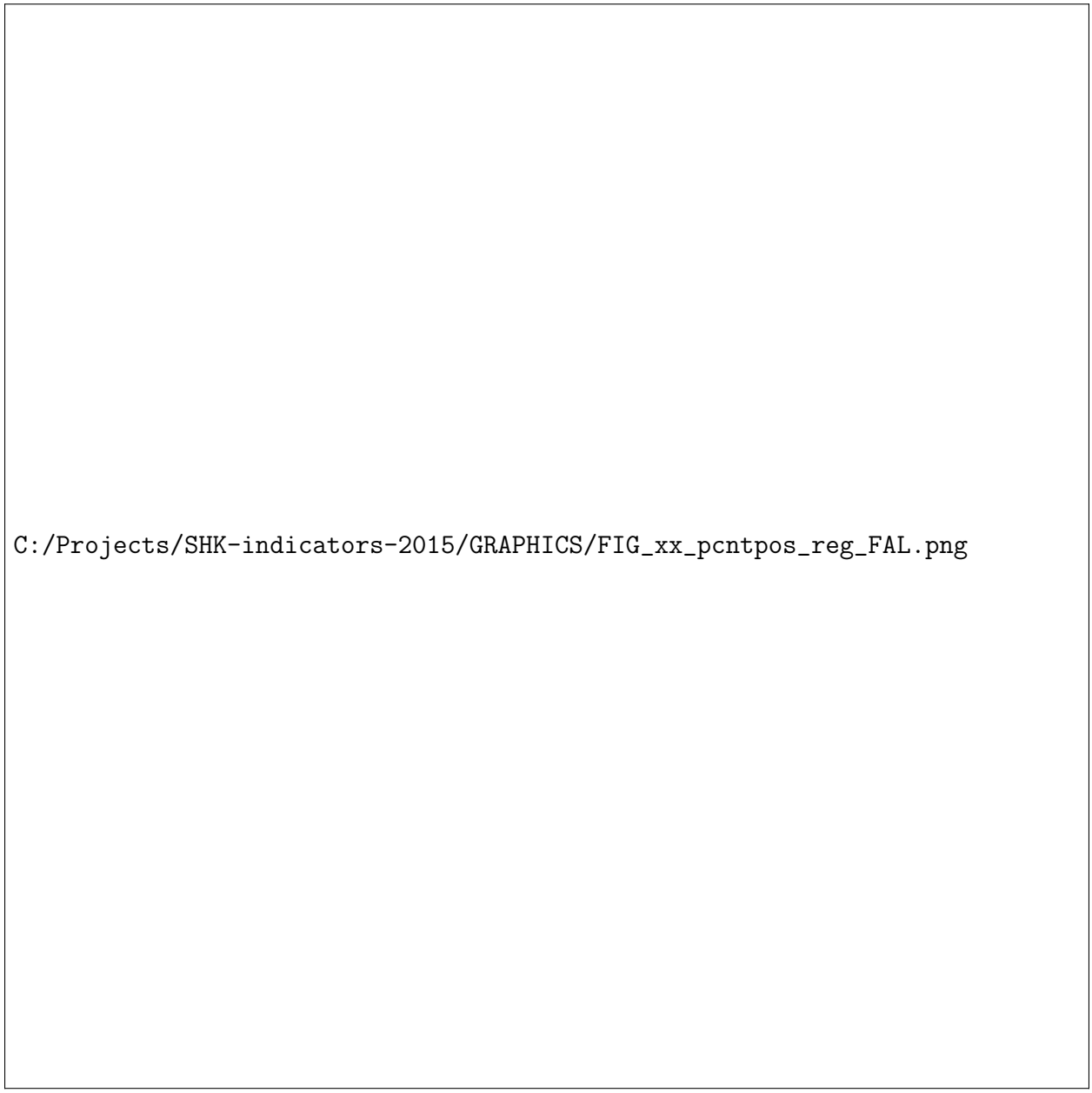


Figure 41: Silky shark CPUE indicators. Proportion of positive sets, observer data.

3.1.4 Oceanic Whitetip Shark

Lcpue$_O CS_N B_c pue$

3.1.5 Thresher Shark

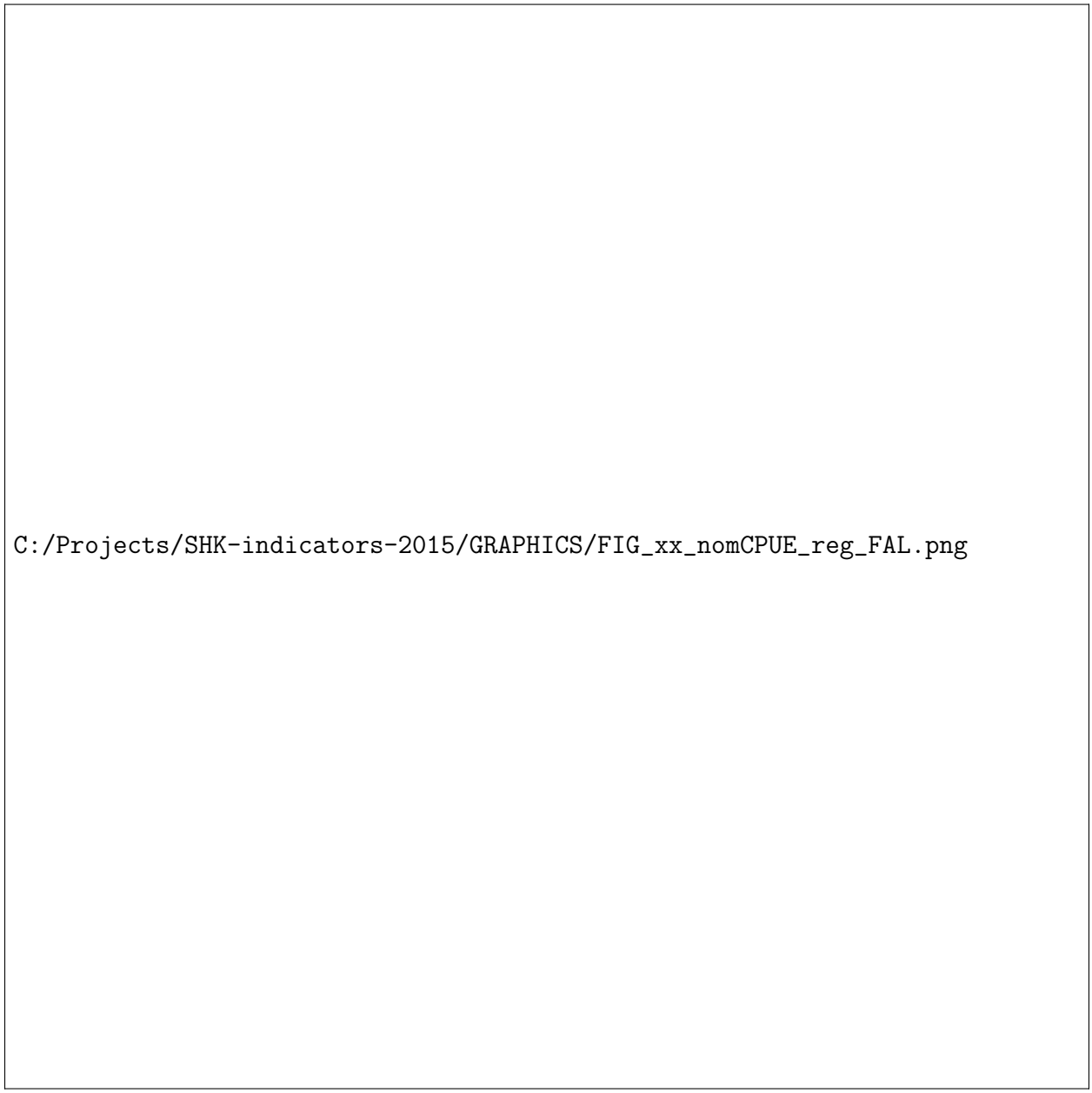


Figure 42: Silky shark CPUE indicators. Nominal CPUE, sharks per 1000 hooks, observer data.

Figure 43: Silky shark CPUE indicators. Standardized CPUE from longline observer data for silky sharks.

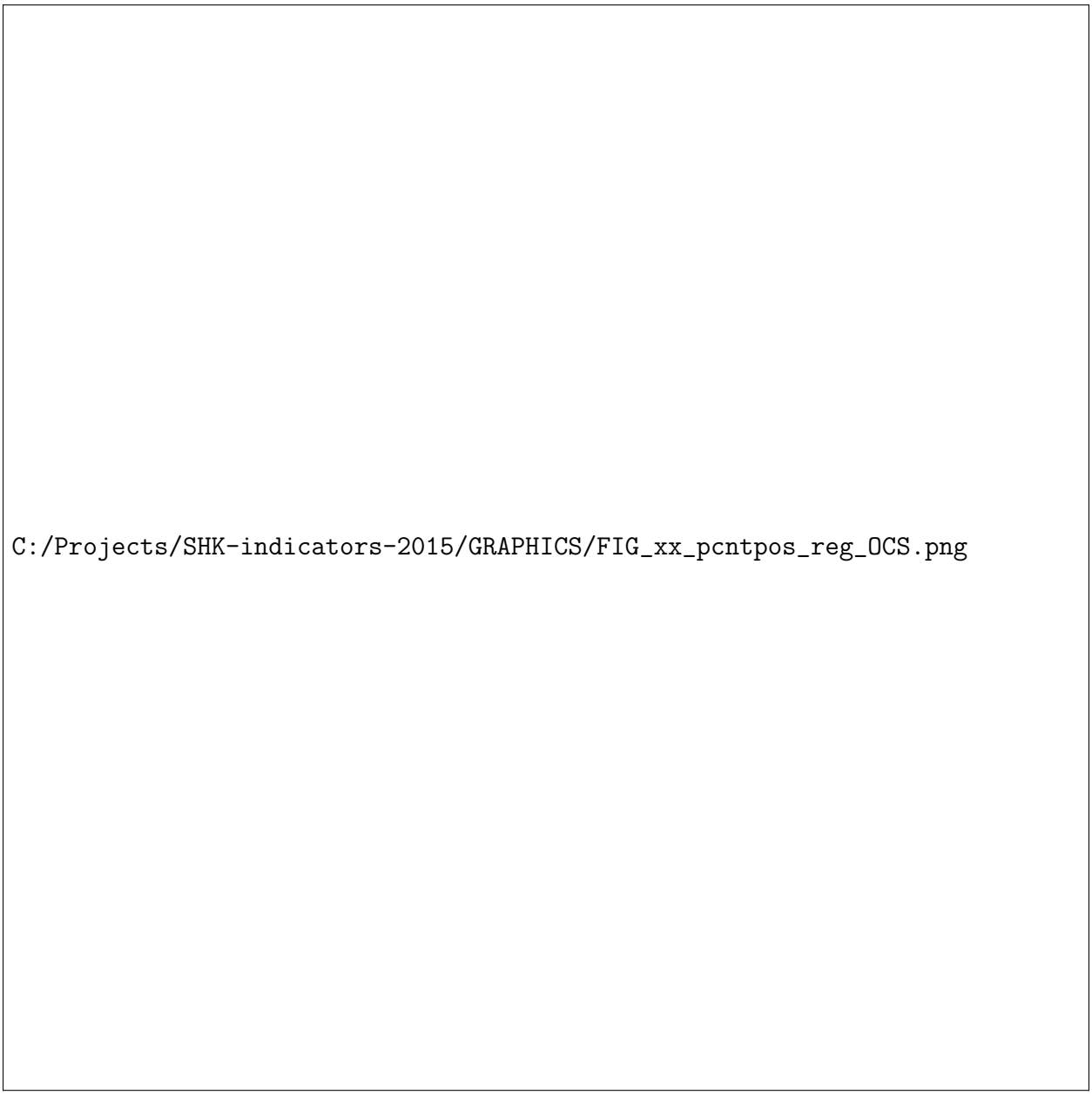


Figure 44: Oceanic whitetip shark CPUE indicators. Proportion of positive sets, observer data.

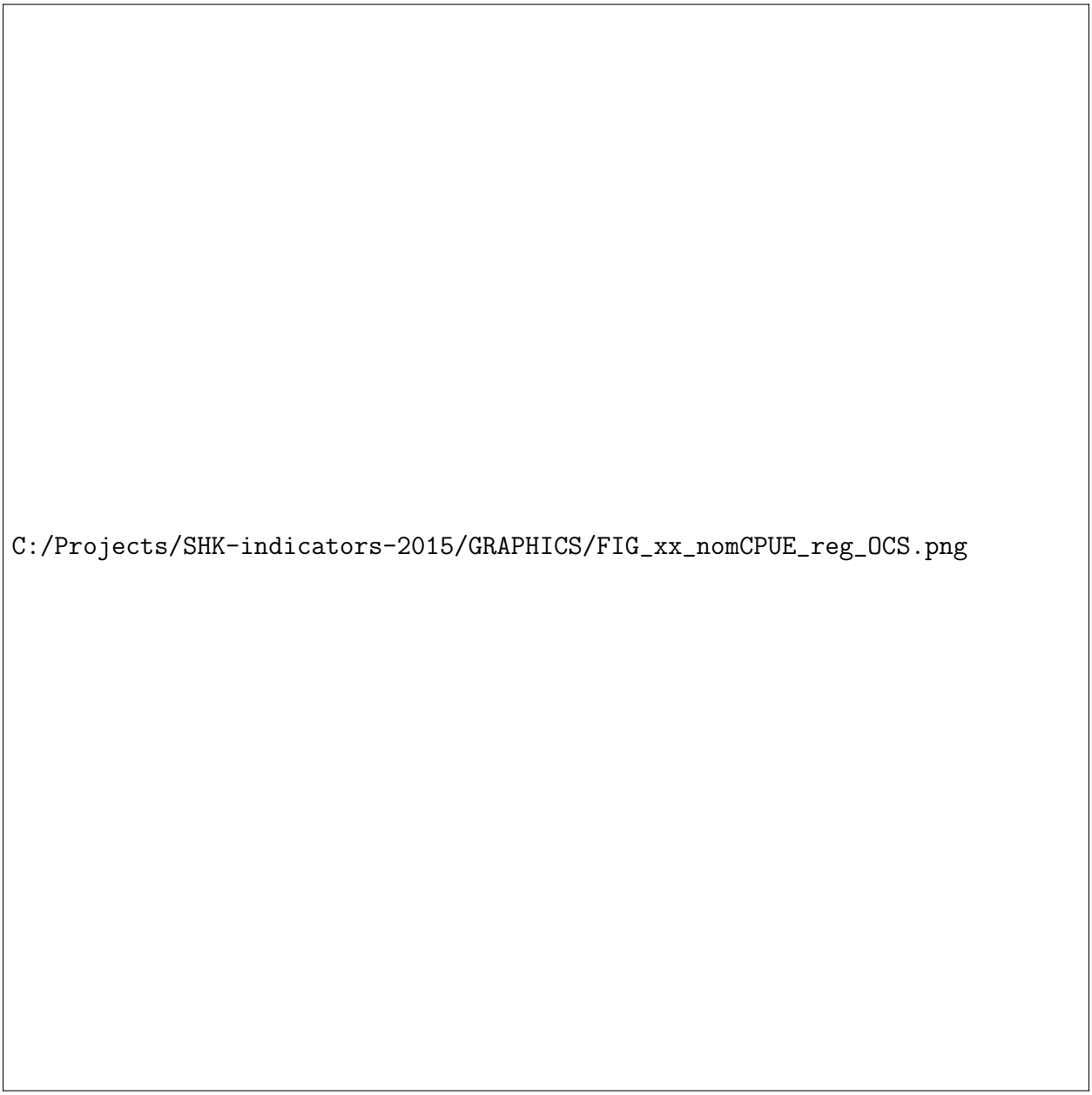


Figure 45: Oceanic whitetip shark CPUE indicators. Nominal CPUE, sharks per 1000 hooks, observer data.

Figure 46: Oceanic whitetip shark CPUE indicators. Standardized CPUE based on negative binomial models applied to observer data.

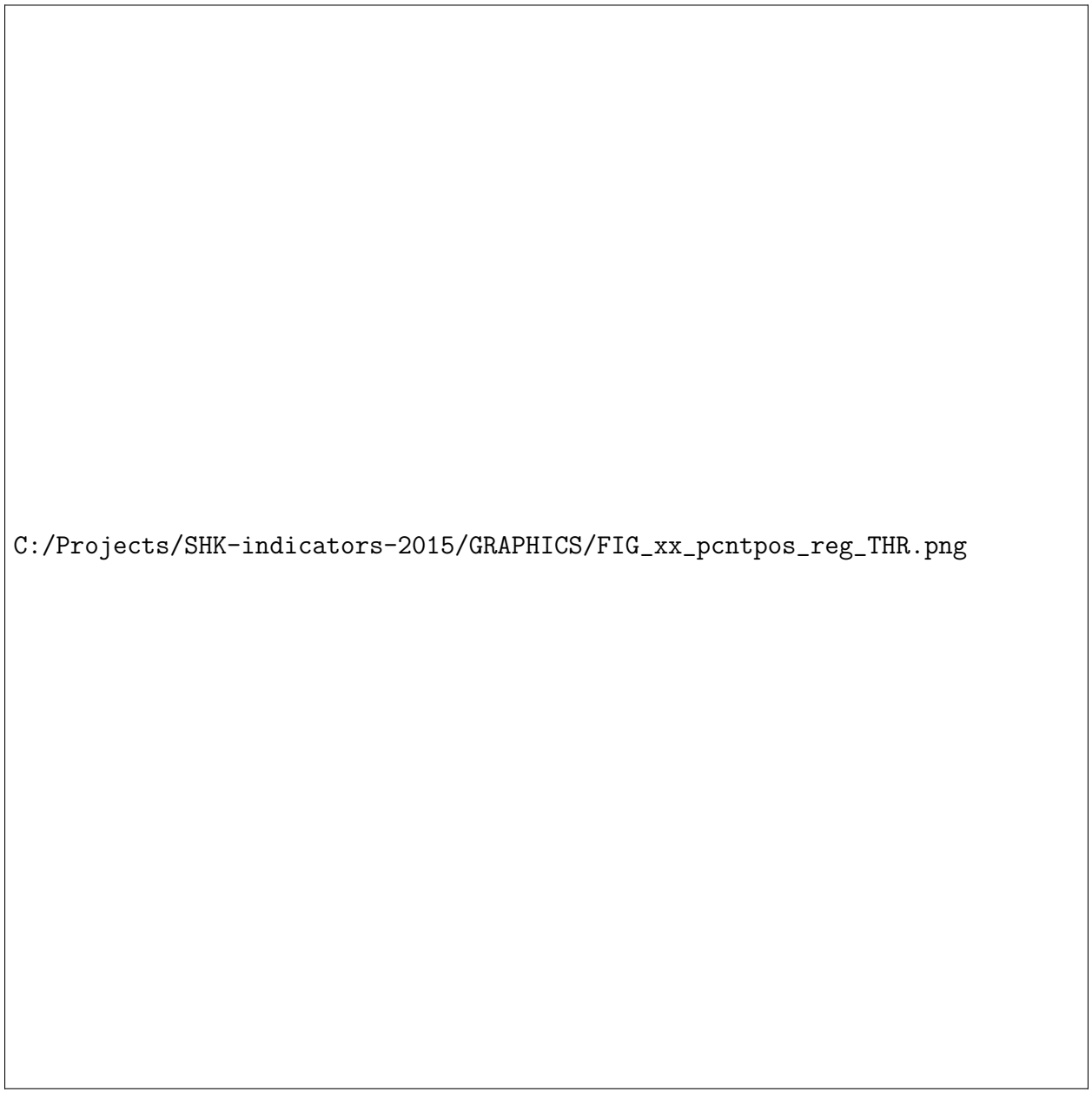


Figure 47: Thresher shark CPUE indicators. Proportion of positive sets, observer data.

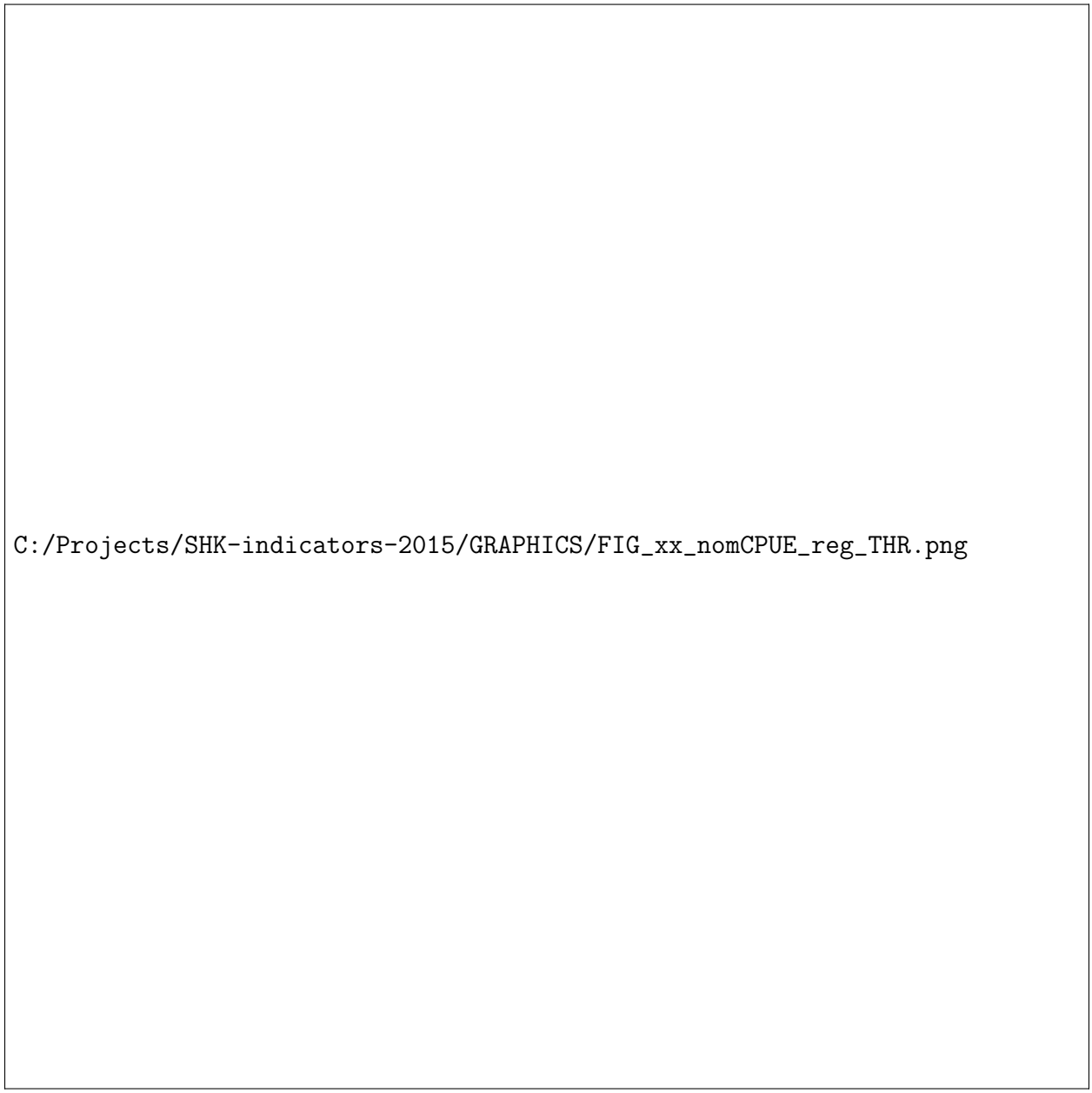


Figure 48: Thresher shark CPUE indicators. Nominal CPUE, sharks per 1000 hooks, observer data.

Figure 49: Thresher shark CPUE indicators. Standardized CPUE of thresher shark based on longline observer data.

4 Biological indicator analyses

5 Feasibility of Stock Assessments

6 Impact of Recent Shark Management Measures

7 Recommendations for Future Indicator Work

8 Management Implications

Acknowledgements

9 Appendices

9.1 CPUE Indicators. Model diagnostics and extra plots

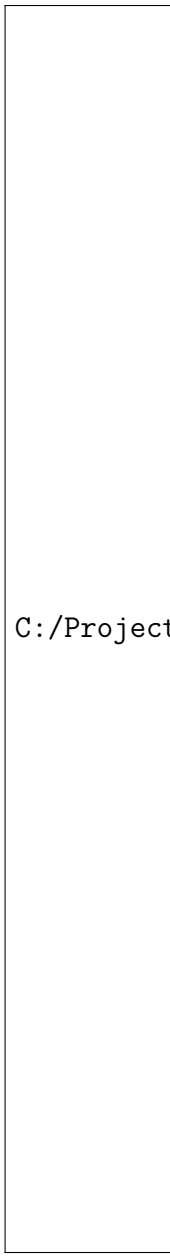
Blue Shark model diagnostics and extra plots

Silky Shark model diagnostics and extra plots

Oceanic Whitetip Shark model diagnostics and extra plots

Thresher Shark model diagnostics and extra plots

Species Distribution Maps



Figu

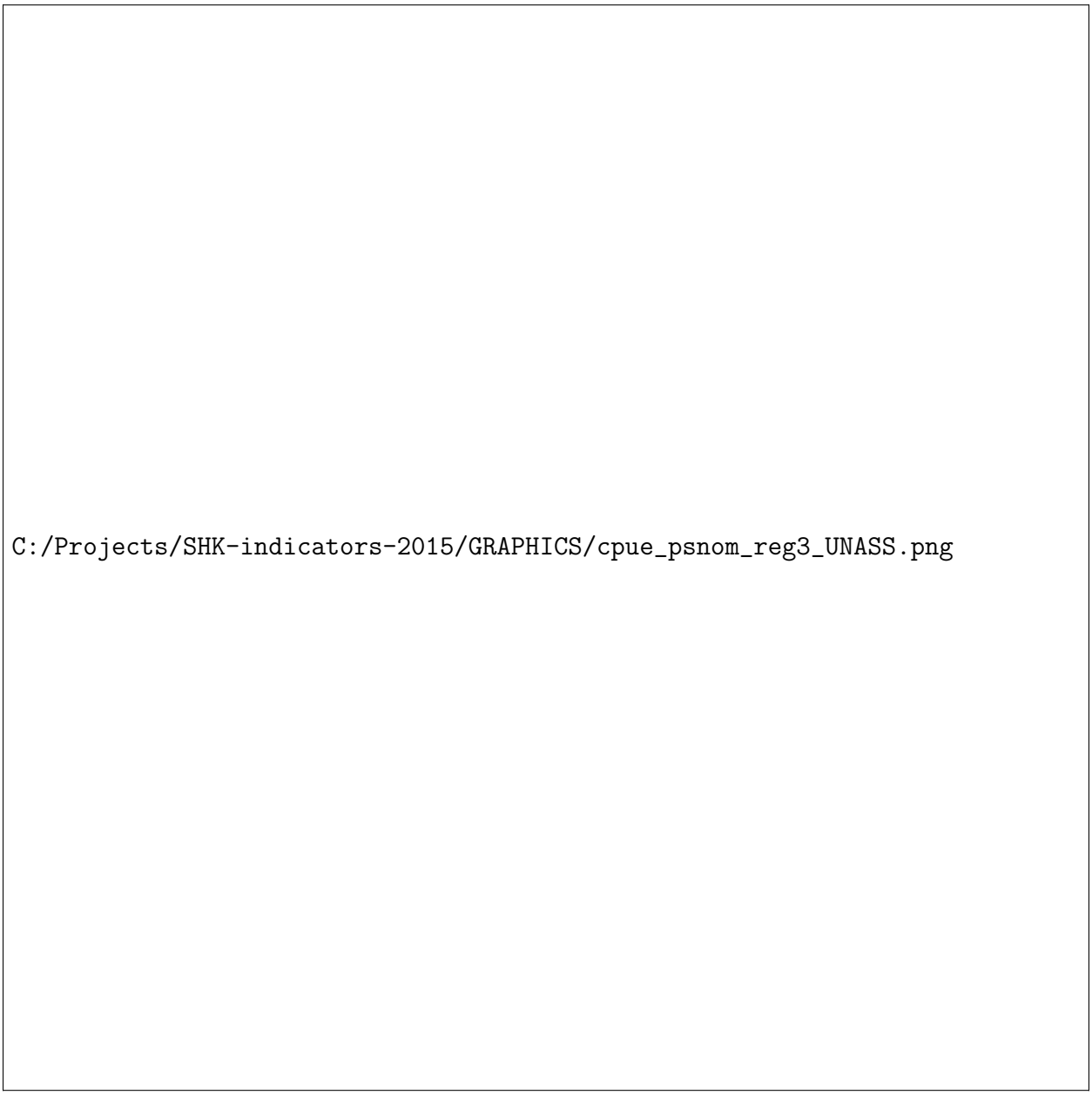


Figure 50: CPUE indicators, nominal CPUE in the purse seine fishery, Unassociated Sets, Region 3.

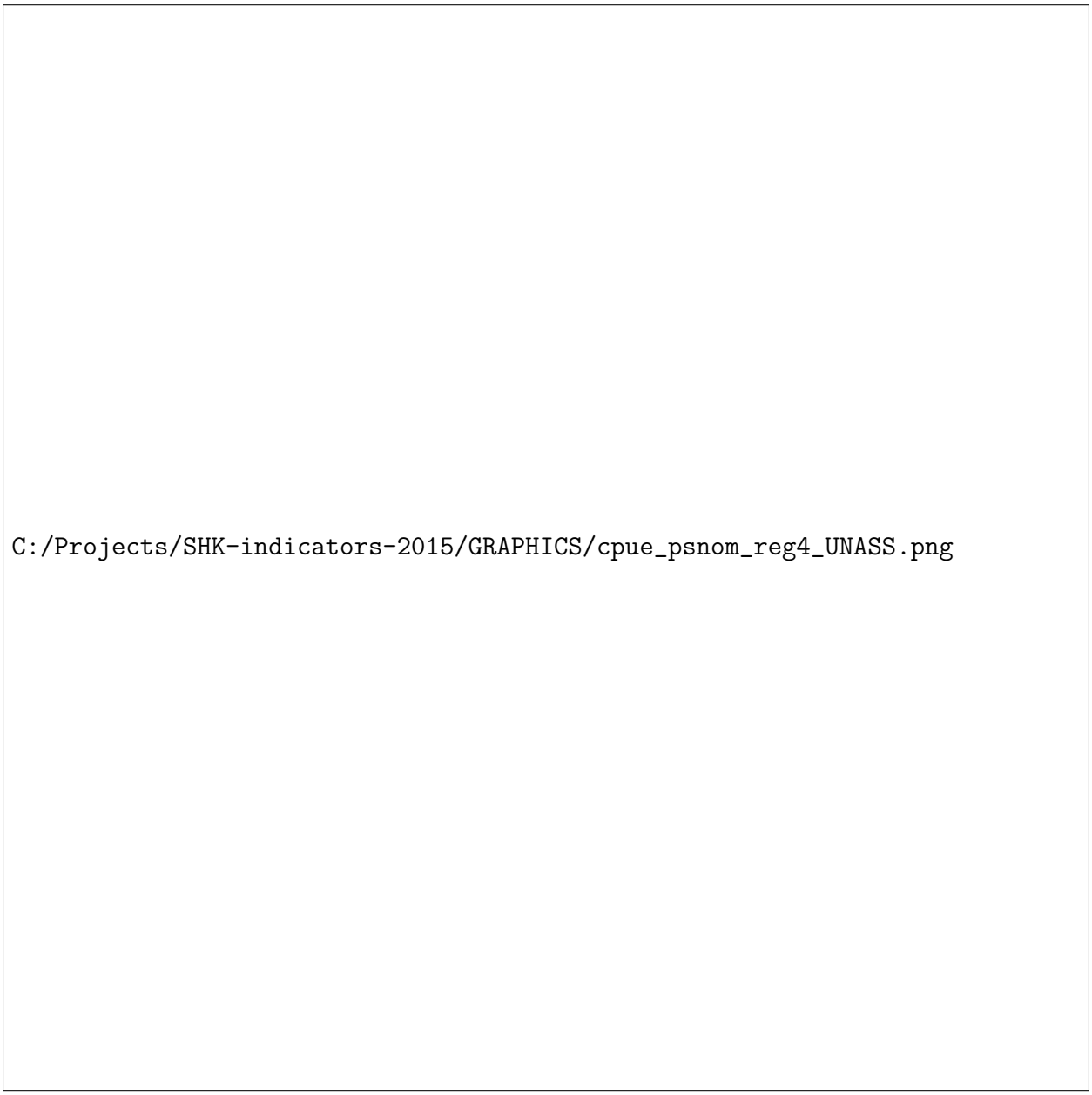


Figure 51: CPUE indicators, nominal CPUE in the purse seine fishery, Unassociated sets, Region 4.

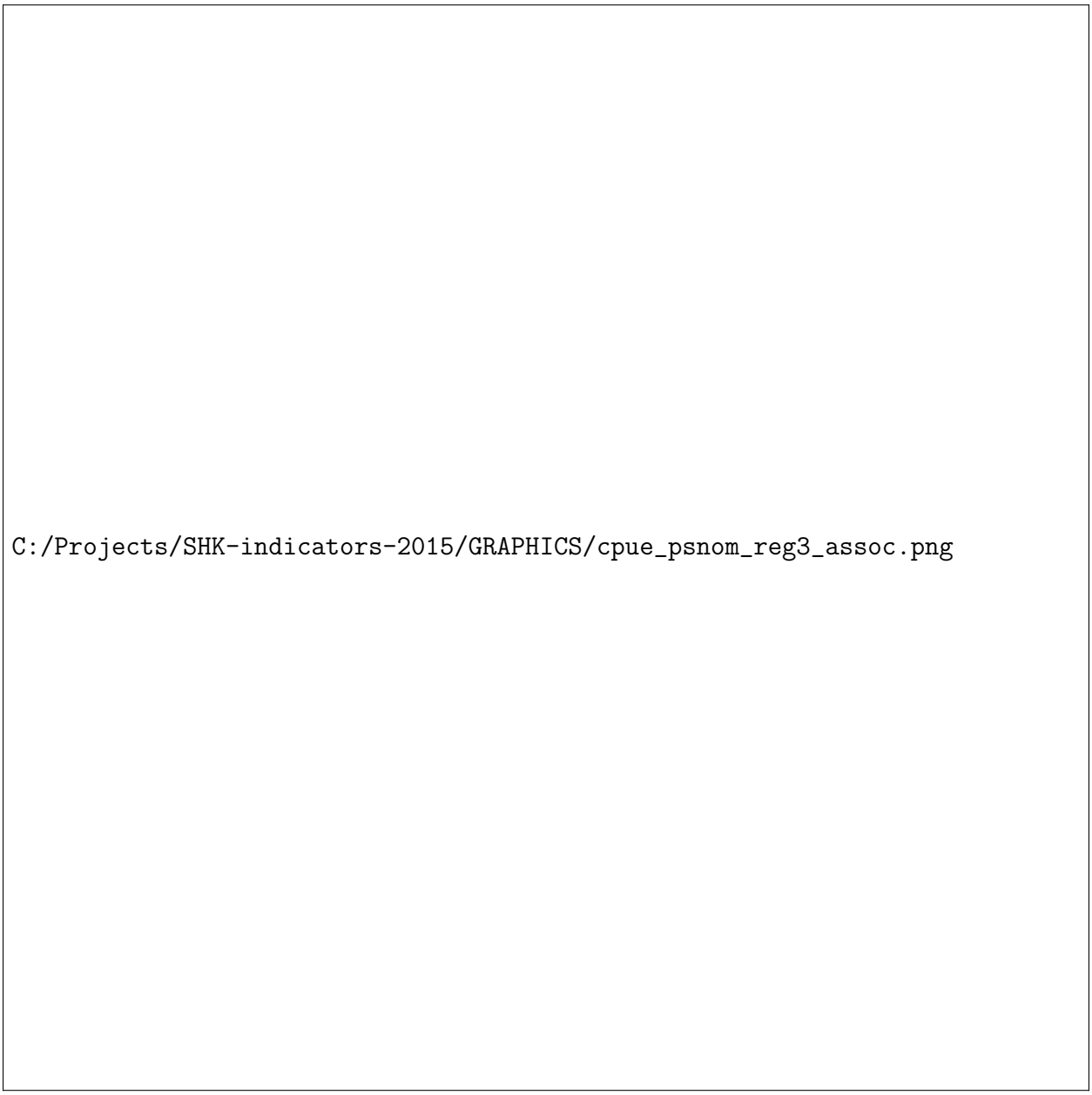


Figure 52: CPUE indicators, nominal CPUE in the purse seine fishery, Associated Sets, Region 3.

Figure 53: CPUE indicators, nominal CPUE in the purse seine fishery, Associated sets, Region 4.

Figure 54: CPUE indicators, GLM model diagnostics .

Figure 55: CPUE indicators, GLM model diagnostics, BSH in the north Pacific step plot.

Figure 56: CPUE indicators, GLM model diagnostics, BSH in the south Pacific step plot.

Figure 57: CPUE indicators, model diagnostics for mako shark CPUE standardization via negative binomial model, northern hemisphere.

Figure 58: CPUE indicators, model diagnostics for mako shark CPUE standardization via negative binomial model, sourthern hemisphere.

Figure 59: CPUE indicators, GLM model diagnostics, mako shark in the north Pacific step plot.

Figure 60: CPUE indicators, step diagnostics for mako shark CPUE standardization via negative binomial model, sourthern hemisphere.

Figure 61: CPUE indicators, model diagnostics for silky shark CPUE standardization via negative binomial model.

Figure 62: CPUE indicators, step plot for silky shark CPUE standardization via negative binomial model.

Figure 63: CPUE indicators, model diagnostics for oceanic whitetip shark CPUE standardization via negative binomial model.

Figure 64: CPUE indicators, stepplot for oceanic whitetip shark CPUE standardization via negative binomial model.

Figure 65: CPUE indicators, model diagnostics for thresher shark CPUE standardization via negative binomial model.

Figure 66: CPUE indicators, stepplot for thresher shark CPUE standardization via negative binomial model.

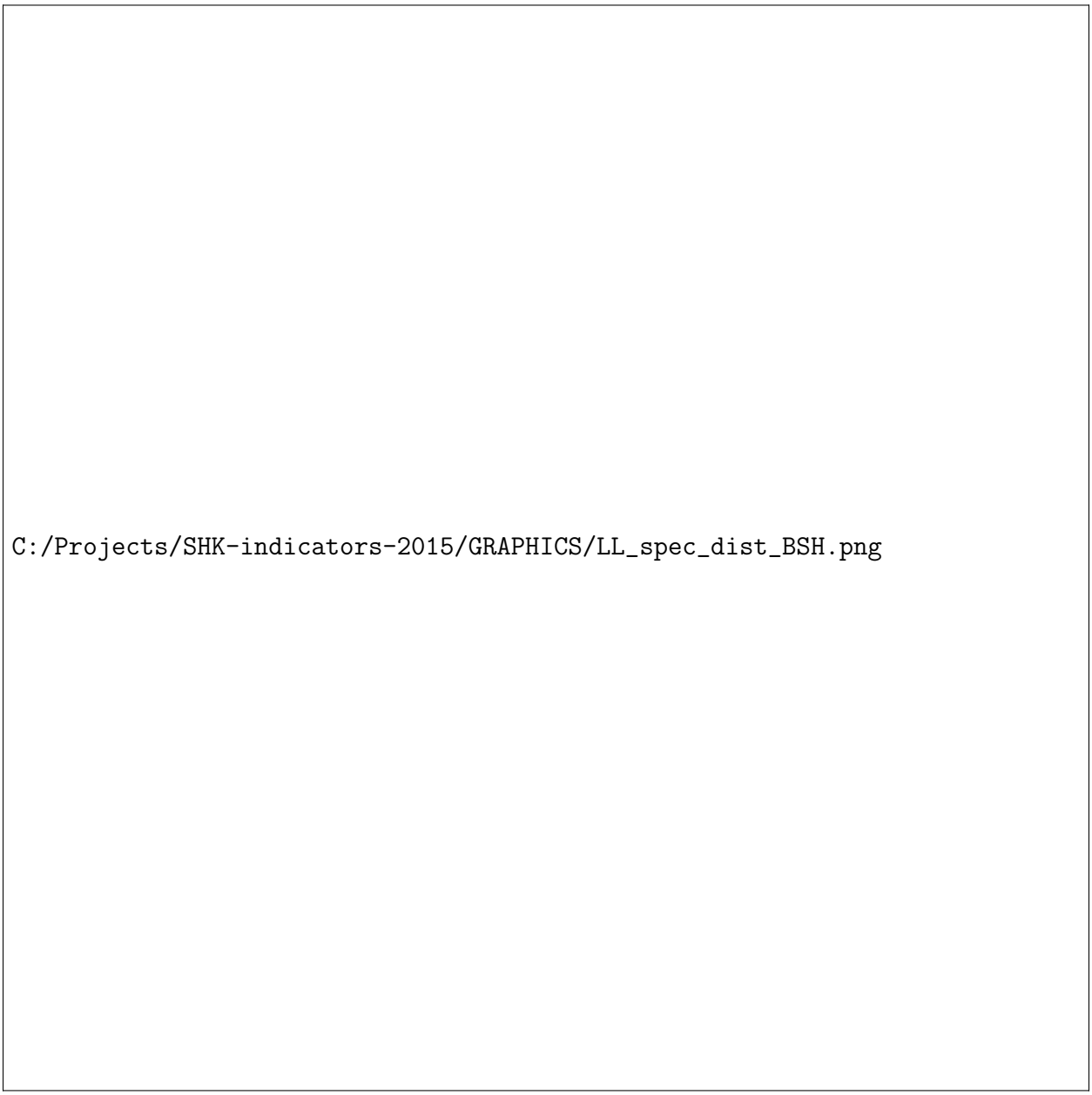


Figure 67: Species distribuion, blue shark observed in the longline fishery.