**Supplementary information**

Table S1. List of Local Fisheries Offices per subregion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **ID** | **Subregion** | **Subregion name** | **Office** | **Longitude** | **Latitude** |
| 1 | LP | La Paz | Cabo San Lucas | -109.916 | 22.8897 |
|  | La Paz | -110.311 | 24.1422 |
| 2 | LO | Loreto | Loreto | -111.343 | 26.0128 |
| 3 | SR | Santa Rosalia | Santa Rosalia | -112.267 | 27.3389 |
| 4 | BA | Bahia de los Angeles | Bahia de los Angeles | -113.564 | 28.9497 |
| 5 | UG | Upper Gulf of California | Golfo de Santa Clara | -114.5 | 31.6867 |
|  | San Felipe | -114.835 | 31.0275 |
| 6 | PP | Puerto Peñasco | Puerto Libertad | -112.683 | 29.9042 |
|  | Puerto Peñasco | -113.537 | 31.3167 |
| 7 | GY | Guaymas | Bahia Kino | -111.941 | 28.8228 |
|  | Guaymas | -110.899 | 27.9183 |
|  | Hermosillo | -111.526 | 28.6397 |
| 8 | HU | Huatabampo | Estacion Don | -109.024 | 26.4236 |
|  | Huatabampo | -109.642 | 26.8275 |
|  | Los Mochis | -108.997 | 25.7936 |
|  | Topolobampo | -109.056 | 25.6297 |
| 9 | GS | Guasave | Guasave | -108.47 | 25.5733 |
|  | La Reforma | -108.056 | 25.0811 |
|  | Navolato | -107.703 | 24.7656 |
| 10 | MZ | Mazatlan | Escuinapa | -105.778 | 22.8333 |
|  | Mazatlan | -106.41 | 23.2414 |
|  | Rosa Morada | -105.204 | 22.1222 |
|  | Tecuala | -105.457 | 22.3972 |
|  | Tuxpan | -105.299 | 21.9436 |
| 11 | BB | Bahia de Banderas | Cruz de Huanacaxtle | -105.382 | 20.7492 |
|  | Peñita de Jaltemba | -105.249 | 21.0386 |
|  | Puerto Vallarta | -105.227 | 20.6136 |
|  | San Blas | -105.178 | 21.7503 |
|  | Santiago Ixcuintla | -105.207 | 21.8114 |
|  | Tepic | -104.894 | 21.5164 |

Table S2. List of Important Resources (species that correspond to 95% of the total ex-vessel revenues per sub-region).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Subregion** | **Subregion name** | **Resource** | **% of total revenues** | **Weight (tonnes)** | **Price per tonne** **(USD)** |
| **1** | La Paz | Red snapper | 28.09 | 32916 | 1903 |
| Lobster | 19.90 | 188458 | 10894 |
| Sharks | 11.42 | 25730 | 1487 |
| Snapper | 5.99 | 24172 | 1397 |
| Groupers | 5.83 | 29274 | 1692 |
| Sea bass | 4.43 | 33811 | 1954 |
| Jacks | 4.43 | 13599 | 786 |
| Ocean whitefish | 3.56 | 13316 | 770 |
| Clams | 3.50 | 6286 | 363 |
| Small sharks | 2.34 | 14127 | 817 |
| Flatfish | 1.88 | 25466 | 1472 |
| Octopus | 1.48 | 34976 | 2022 |
| Squid | 1.24 | 2920 | 169 |
| Rays | 1.21 | 12176 | 704 |
| **2** | Loreto | Red snapper | 44.13 | 45857 | 2651 |
| Snapper | 14.16 | 29697 | 1717 |
| Groupers | 10.49 | 36016 | 2082 |
| Jacks | 7.89 | 12937 | 748 |
| Sharks | 5.11 | 10070 | 582 |
| Ocean whitefish | 4.58 | 11378 | 658 |
| Catfish | 4.42 | 42573 | 2461 |
| Small sharks | 2.08 | 11983 | 693 |
| Rays | 1.52 | 9161 | 530 |
| Sea bass | 1.24 | 49365 | 2853 |
| **3** | Santa Rosalia | Squid | 40.20 | 4303 | 249 |
| Groupers | 13.27 | 20154 | 1165 |
| Jacks | 7.85 | 13539 | 783 |
| Flatfish | 7.12 | 29973 | 1733 |
| Lobster | 5.09 | 329168 | 19027 |
| Octopus | 4.91 | 34466 | 1992 |
| Sharks | 2.96 | 13426 | 776 |
| Snapper | 2.24 | 27932 | 1615 |
| Blue crab | 2.20 | 24220 | 1400 |
| Gulf weakfish | 2.09 | 17128 | 990 |
| Red snapper | 1.73 | 35143 | 2031 |
| Rays | 1.56 | 11475 | 663 |
| Small sharks | 1.38 | 13932 | 805 |
| Mullets | 1.29 | 9463 | 547 |
| Clams | 1.15 | 10072 | 582 |
| **4** | Bahia de los Angeles | Octopus | 35.70 | 34335 | 1985 |
| Squid | 14.52 | 6663 | 385 |
| Jacks | 11.15 | 14512 | 839 |
| Flatfish | 7.46 | 23218 | 1342 |
| Sharks | 7.18 | 18482 | 1068 |
| Groupers | 6.55 | 15002 | 867 |
| Catfish | 4.26 | 38325 | 2215 |
| Small sharks | 3.24 | 15945 | 922 |
| Rays | 3.00 | 14180 | 820 |
| Clams | 2.21 | 58327 | 3371 |
| **5** | Upper Gulf of California | Shrimp | 43.38 | 181339 | 10482 |
| Gulf croaker | 18.63 | 12509 | 723 |
| Mackerels | 14.32 | 14672 | 848 |
| Gulf weakfish | 11.14 | 37972 | 2195 |
| Clams | 8.50 | 18904 | 1093 |
| **6** | Puerto Peñasco | Shrimp | 40.86 | 113248 | 6546 |
| Clams | 13.55 | 33761 | 1951 |
| Flatfish | 9.75 | 16837 | 973 |
| Blue crab | 9.16 | 13903 | 804 |
| Gulf croaker | 7.97 | 7819 | 452 |
| Rays | 4.71 | 10941 | 632 |
| Sharks | 3.85 | 11692 | 676 |
| Catfish | 2.73 | 32540 | 1881 |
| Snails | 2.48 | 8849 | 511 |
| **7** | Guaymas | Shrimp | 47.19 | 92128 | 5325 |
| Blue crab | 12.11 | 15737 | 910 |
| Squid | 7.76 | 4739 | 274 |
| Mackerels | 4.97 | 12691 | 734 |
| Snails | 4.07 | 18892 | 1092 |
| Flatfish | 3.73 | 24968 | 1443 |
| Octopus | 3.50 | 44905 | 2596 |
| Clams | 2.41 | 25943 | 1500 |
| Jacks | 1.92 | 18939 | 1095 |
| Snapper | 1.80 | 36781 | 2126 |
| Gulf weakfish | 1.72 | 16953 | 980 |
| Groupers | 1.50 | 30539 | 1765 |
| Catfish | 1.35 | 38766 | 2241 |
| Lobster | 1.14 | 105631 | 6106 |
| **8** | Huatabampo | Shrimp | 68.12 | 84044 | 4858 |
| Blue crab | 13.15 | 13375 | 773 |
| Red snapper | 3.36 | 35581 | 2057 |
| Flatfish | 3.08 | 20720 | 1198 |
| Sharks | 1.49 | 17098 | 988 |
| Mackerels | 1.31 | 13289 | 768 |
| Squid | 1.20 | 6477 | 374 |
| Gulf croaker | 1.14 | 7972 | 461 |
| Snails | 1.04 | 17674 | 1022 |
| Mullets | 0.96 | 6314 | 365 |
| Catfish | 0.86 | 26205 | 1515 |
| **9** | Navolato | Shrimp | 47.58 | 84046 | 4858 |
| Blue crab | 23.09 | 16241 | 939 |
| Gulf weakfish | 2.97 | 40693 | 2352 |
| Small sharks | 2.95 | 23378 | 1351 |
| Snapper | 2.76 | 51282 | 2964 |
| Sharks | 2.56 | 21313 | 1232 |
| Rays | 2.51 | 24829 | 1435 |
| Mullets | 2.26 | 10381 | 600 |
| Mojarra | 2.14 | 13993 | 809 |
| Catfish | 2.06 | 32660 | 1888 |
| Red snapper | 2.01 | 51710 | 2989 |
| Mackerels | 1.89 | 16234 | 938 |
| **10** | Mazatlan | Shrimp | 72.73 | 84532 | 4886 |
| Sharks | 4.70 | 9055 | 523 |
| Snooks | 3.61 | 40361 | 2333 |
| Mojarra | 3.39 | 11322 | 654 |
| Snapper | 3.19 | 41312 | 2388 |
| Squid | 2.03 | 5514 | 319 |
| Gulf weakfish | 2.01 | 22858 | 1321 |
| Catfish | 1.53 | 10980 | 635 |
| **11** | Bahia de Banderas | Mojarra | 39.94 | 15082 | 872 |
| Red snapper | 11.99 | 47114 | 2723 |
| Snapper | 8.60 | 42344 | 2448 |
| Oyster | 6.08 | 15278 | 883 |
| Shrimp | 5.21 | 46489 | 2687 |
| Mackerels | 4.78 | 20411 | 1180 |
| Snooks | 4.64 | 43327 | 2504 |
| Gulf weakfish | 4.22 | 25979 | 1502 |
| Sharks | 3.09 | 11777 | 681 |
| Catfish | 2.90 | 9415 | 544 |
| Small sharks | 2.11 | 21144 | 1222 |
| Gulf croaker | 1.12 | 13131 | 759 |
| Octopus | 1.00 | 52042 | 3008 |

Table S3. Comparison of B/Bmsy and r values from this study with previous estimates for the Gulf of California.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Resource** | **Mean B/Bmsy** | **SD B/Bmsy** | **Mean r** | **B/Bmsy Literature** | **Reference B/Bmsy** | **r Literature** | **Reference r** | **% Diff. B/Bmsy** | **% Diff. r** |
| Clams | 0.36 | 0.14 | 0.52 | 0.55 | Cisneros-Mata, 2016 | 0.525 | Cisneros-Mata, 2016 | 9% | 1% |
| Catfish | 0.78 | 0.09 | 0.41 | Near msy | Arreguin, 2011 |  |  |  |  |
| Gulf croaker | 0.54 | 0.04 | 0.56 | Near msy | Arreguin, 2011 |  |  |  |  |
| Groupers | 0.47 | 0.09 | 0.28 | Overexploited | Arreguin, 2011 |  |  |  |  |
| Squid | 0.14 | 0.08 | 0.93 |  |  | 1.2 | Cisneros-Mata, 2016 |  | 23% |
| Shrimp | 0.62 | 0.11 | 0.54 | 0.7 | Cisneros-Mata, 2016 | 0.6 | Cisneros-Mata, 2016 | 0% | 10% |
| Snails | 1.02 | 0.45 | 0.57 | 0.9 | Cisneros-Mata, 2016 | 0.5 | Cisneros-Mata, 2016 | 0% | 13% |
| Small sharks | 0.47 | 0.11 | 0.06 | 0.4 | Cisneros-Mata, 2016 |  | Cisneros-Mata, 2016 | 0% |  |
| Gulf weakfish | 0.52 | 0.07 | 0.54 | 0.9 | Cisneros-Mata, 2016 | 0.6 | Cisneros-Mata, 2016 | 34% | 9% |
| Red snapper | 0.87 | 0.13 | 0.56 | 0.8 | Cisneros-Mata, 2016 | 0.5 | Cisneros-Mata, 2016 | 0% | 12% |
| Blue crab | 0.82 | 0.07 | 0.57 | 0.8 | Cisneros-Mata, 2016 | 0.5 | Cisneros-Mata, 2016 | 0% | 13% |
| Jacks | 0.64 | 0.21 | 0.48 | Developing | Arreguin, 2011 |  |  |  |  |
| Lobster | 0.87 | 0.10 | 0.56 | 0.9 | Cisneros-Mata, 2016 | 0.5 | Cisneros-Mata, 2016 | 0% | 11% |
| Flatfish | 0.51 | 0.08 | 0.28 | Near msy | Arreguin, 2011 |  |  |  |  |
| Mullets | 0.43 | 0.06 | 0.54 | Overexploited | Arreguin, 2011 |  |  |  |  |
| Sea bass | 0.59 | 0.01 | 0.06 | 0.8 | Cisneros-Mata, 2016 |  | Cisneros-Mata, 2016 | 13% |  |
| Mojarra | 0.52 | 0.06 | 0.28 | Near msy | Arreguin, 2011 |  |  |  |  |
| Oyster | 0.39 | 0.00 | 0.56 | Overexploited | Arreguin, 2011 |  |  |  |  |
| Snapper | 0.52 | 0.07 | 0.31 | Near msy | Arreguin, 2011 |  |  |  |  |
| Ocean whitefish | 1.20 | 0.20 | 0.28 | Near msy | Arreguin, 2011 |  |  |  |  |
| Octopus | 0.48 | 0.05 | 1.01 | 0.3 | Cisneros-Mata, 2016 | 1.2 | Cisneros-Mata, 2016 | 43% | 16% |
| Rays | 0.96 | 0.07 | 0.06 | Near msy | Arreguin, 2011 |  |  |  |  |
| Snooks | 0.46 | 0.00 | 0.55 | 0.5 | Cisneros-Mata, 2016 | 0.5 | Cisneros-Mata, 2016 | 8% | 1% |
| Mackerels | 0.74 | 0.24 | 0.50 | 0.5 | Cisneros-Mata, 2016 | 0.7 | Cisneros-Mata, 2016 | 0% | 1% |
| Sharks | 0.83 | 0.16 | 0.06 | 0.4 | Cisneros-Mata, 2016 | 0.3 | Cisneros-Mata, 2016 | 43% | 2% |

**Supplementary material 1.**

Conditions to define biomass priors (B/Bk). All methods are based on Froese *et al.* 2017 and adapted to incorporate historical records from FAO.

1. **Infer Bstart/Bk priors from FAO historical landing reports**
2. No records before 1995. B/Bk = 0.6 - 0.9
3. Historical max (1950 – 1999) < mean of 2000-2002. Bstart/Bk = [0.5, 0.8]
4. Historical max (1950 – 1999) = mean of 2000-2002. Bstart/Bk = [0.4, 0.6]
5. Historical max (1950 – 1999) > mean of 2000-2002. Bstart/Bk = [0.2, 0.5]
6. **Infer Bint/Bk priors from resource’s time series**
7. Calculate contrast between catch at intermediate and starting years.
8. If < 0. Bint/Bk = Bstart/Bk – 0.1
9. If = 0. Bint/Bk = Bstart/Bk
10. If > 0. Bint/Bk = Bstart/Bk + 0.1
11. **Infer Bfinal/Bk priors from resource’s time series**
12. Calculate contrast between maximum catch and final catch
13. If = 1. Bfinal/Bk = Bstart/Bk + 0.1
14. If < 0.5. Bfinal/Bk = [0.01, 0.4]
15. If < 0.35. Bfinal/Bk = [0.01, 0.3]
16. If < 0.15. Bfinal/Bk = [0.01, 0.2]
17. If < 0.05. Bfinal/Bk = [0.01, 0.1]
18. If > 0.5 & < 1. Bfinal/Bk = Bstart/Bk

\* All differences are calculated with a margin of 20 %

**References**

Froese, R., Demirel, N., Coro, G., Kleisner, K.M. and Winker, H. (2017) Estimating fisheries reference points from catch and resilience. *Fish and Fisheries* **18**, 506–526.



Figure S1. Current state of fisheries and trends between 2012-2016 for 121 SFUs in the Gulf of California. **A)** Kobe plot (B/Bmsy vs. F/Fmsy) of SFU that represent 95% of the total revenues per subregion. Numbers in parentheses represent the number of SFUs in each graphic quadrant. **B)** Distribution of the linear trend in B/Bmsy between 2012-2016 for each SFU. B.slope was calculated as the average rate of change of B/Bmsy. **C)** Distribution of the trend in F/Fmsy between 2012 and 2016 for each SFU. F.slope was calculated as the average rate of change of F/Fmsy.

**Supplementary material 2.**

We performed an analysis to evaluate whether the estimation of population parameters r (intrinsic rate of population growth) and k (carrying capacity) through the use of the catch-only method proposed by Froese *et al.* (2017) varies with time series length. To do so, we simulated catches of 24 stocks for a period of 50 years each. We tested a wide range of combinations between fisheries catches trends (low/medium/high catches in the beginning/middle/end of the time period), and the resilience, r and k for each stock (See **Table S4** for specifications of each stock). We then generated 3 time series for each stock (15, 30 and 50 years length, 72 time series in total). To simulate an analogous situation to our dataset, in which we just have access to the last 16 years, the time series for 15 and 30 years were subsampled from the end of their respective time series.

For each of the 72 time series, we estimated the population parameters as explained in Froese *et al.* (2017) and following the rules to assign biomass priors (B/Bk) as explained in **Supplementary material 1**. We then estimated the ratios restimated/rtrue and kestimated/ktrue and ran a one-way ANOVA between time series grouped by time series length to test whether the ratios of estimated parameters by true parameters were significantly different. The results are presented in **Figure S2**. We found no significant differences between population parameter estimates for different time series lengths. All estimates include the true estimate in their confidence intervals.



Figure S2. Comparison of the ratios between estimated population parameters (r and K) and true simulated population parameters (true r and true K) for different time series lengths.