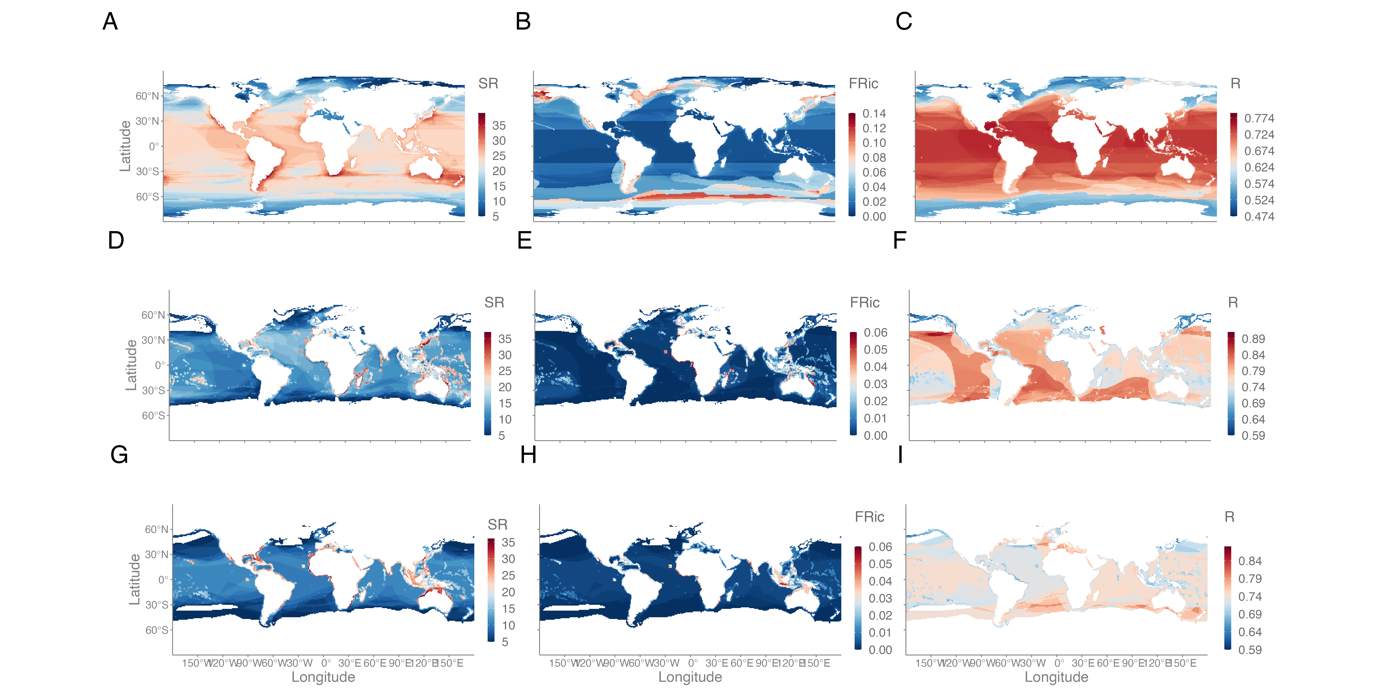
**Supplementary material**



**Figure S1**. Global patterns of SR, FRic, and FRed of marine mammals (A, B, C), fish (D, E, F), and sharks and rays (G, H, I).

A picture containing diagram

Description automatically generated

**Figure S2.** (A) Map of residuals of the relationship between functional and species richness, (B) Scatterplot of the relationship between functional and species richness with a fitted loess curve.

Chart

Description automatically generated

**Figure S3**. Heatmap of the Jaccad dissimilarity indices among marine provinces of FRic hotspots (A) and FRed coldspots (B). Mean of pairwise dissimilarity is reported for each province.

A picture containing diagram

Description automatically generated

**Figure S4**. Number that each of the top 10 FUSE species appear in provinces of FRic hotspots (A) and FRed coldspots (B). Red dots indicate that species appear in more than 50% of provinces, while blue dots in less than 50%.

**Table S1**. List of the top 10 FUSE species per marine province of FRic hotspots (≥ 10 hotspot cells per province).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Province  (N cells) | Species | Higher classification | FUSE | IUCN status | Global FUSE rank |
| Western Coral Triangle  (299) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Pristis pristis | Shark/ray | 0,511 | CR | 9 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Thunnus maccoyii | Fish | 0,492 | CR | 12 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Orcaella brevirostris | Cetacean | 0,386 | EN | 24 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Urogymnus polylepis | Shark/ray | 0,283 | EN | 39 |
| Sunda Shelf  (115) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Pristis pristis | Shark/ray | 0,511 | CR | 9 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Orcaella brevirostris | Cetacean | 0,386 | EN | 24 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Sphyrna lewini | Shark/ray | 0,176 | EN | 46 |
| Natator depressus | Reptile | 0,163 | EN | 48 |
| Eastern Coral Triangle  (93) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Pristis pristis | Shark/ray | 0,511 | CR | 9 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Sphyrna lewini | Shark/ray | 0,176 | EN | 46 |
| Natator depressus | Reptile | 0,163 | EN | 48 |
| Cheilinus undulatus | Fish | 0,133 | EN | 51 |
| Sahul Shelf  (90) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Pristis pristis | Shark/ray | 0,511 | CR | 9 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Thunnus maccoyii | Fish | 0,492 | CR | 12 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Sphyrna lewini | Shark/ray | 0,176 | EN | 46 |
| Natator depressus | Reptile | 0,163 | EN | 48 |
| Tropical Southwestern Pacific  (56) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Pristis pristis | Shark/ray | 0,511 | CR | 9 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Sphyrna lewini | Shark/ray | 0,176 | EN | 46 |
| Natator depressus | Reptile | 0,163 | EN | 48 |
| Sphyrna mokarran | Shark/ray | 0,147 | EN | 50 |
| Marshall, Gilbert and Ellis Islands  (54) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Sphyrna lewini | Shark/ray | 0,176 | EN | 46 |
| Cheilinus undulatus | Fish | 0,133 | EN | 51 |
| Tridacna gigas | Mollusc | 0,083 | VU | 55 |
| Dermochelys coriacea | Reptile | 0,064 | VU | 61 |
| Gulf of Guinea  (47) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Pristis pristis | Shark/ray | 0,511 | CR | 9 |
| Pristis pectinata | Shark/ray | 0,509 | CR | 10 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Sousa teuszii | Cetacean | 0,433 | CR | 18 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Rostroraja alba | Shark/ray | 0,237 | EN | 41 |
| South China Sea  (42) | Acipenser sinensis | Fish | 0,556 | CR | 5 |
| Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Pristis pristis | Shark/ray | 0,511 | CR | 9 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Bahaba taipingensis | Fish | 0,491 | CR | 13 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Stereolepis gigas | Fish | 0,352 | CR | 29 |
| Tropical Northwestern Pacific  (41) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Eubalaena japonica | Cetacean | 0,369 | EN | 26 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Stereolepis gigas | Fish | 0,352 | CR | 29 |
| Sphyrna mokarran | Shark/ray | 0,147 | EN | 50 |
| Cheilinus undulatus | Fish | 0,133 | EN | 51 |
| Warm Temperate Northeast Pacific  (33) | Phocoena sinus | Cetacean | 0,523 | CR | 6 |
| Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Pristis pristis | Shark/ray | 0,511 | CR | 9 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Enhydra lutris | Otter | 0,39 | EN | 23 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Stereolepis gigas | Fish | 0,352 | CR | 29 |
| Warm Temperate Northwest Pacific  (29) | Acipenser sinensis | Fish | 0,556 | CR | 5 |
| Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Bahaba taipingensis | Fish | 0,491 | CR | 13 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Eubalaena japonica | Cetacean | 0,369 | EN | 26 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Stereolepis gigas | Fish | 0,352 | CR | 29 |
| Northeast Australian Shelf  (28) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Pristis pristis | Shark/ray | 0,511 | CR | 9 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Sphyrna lewini | Shark/ray | 0,176 | EN | 46 |
| Natator depressus | Reptile | 0,163 | EN | 48 |
| Sphyrna mokarran | Shark/ray | 0,147 | EN | 50 |
| Andaman  (24) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Pristis pristis | Shark/ray | 0,511 | CR | 9 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Orcaella brevirostris | Cetacean | 0,386 | EN | 24 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Sphyrna lewini | Shark/ray | 0,176 | EN | 46 |
| Sphyrna mokarran | Shark/ray | 0,147 | EN | 50 |
| South Kuroshio  (22) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Stereolepis gigas | Fish | 0,352 | CR | 29 |
| Sphyrna lewini | Shark/ray | 0,176 | EN | 46 |
| Sphyrna mokarran | Shark/ray | 0,147 | EN | 50 |
| Cheilinus undulatus | Fish | 0,133 | EN | 51 |
| West African Transition  (16) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Dipturus batis | Shark/ray | 0,284 | CR | 38 |
| Rostroraja alba | Shark/ray | 0,237 | EN | 41 |
| Sphyrna lewini | Shark/ray | 0,176 | EN | 46 |
| Ginglymostoma cirratum | Shark/ray | 0,152 | EN | 49 |
| Northwest Australian Shelf  (13) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Pristis pristis | Shark/ray | 0,511 | CR | 9 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Thunnus maccoyii | Fish | 0,492 | CR | 12 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Sphyrna lewini | Shark/ray | 0,176 | EN | 46 |
| Natator depressus | Reptile | 0,163 | EN | 48 |
| Hawaii  (13) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Neomonachus schauinslandi | Pinniped | 0,37 | EN | 25 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Stereolepis gigas | Fish | 0,352 | CR | 29 |
| Sphyrna lewini | Shark/ray | 0,176 | EN | 46 |
| Balaenoptera physalus | Cetacean | 0,067 | VU | 57 |
| Java Transitional  (11) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Pristis pristis | Shark/ray | 0,511 | CR | 9 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Orcaella brevirostris | Cetacean | 0,386 | EN | 24 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Sphyrna lewini | Shark/ray | 0,176 | EN | 46 |
| Cheilinus undulatus | Fish | 0,133 | EN | 51 |
| East Central Australian Shelf  (11) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Thunnus maccoyii | Fish | 0,492 | CR | 12 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Sphyrna lewini | Shark/ray | 0,176 | EN | 46 |
| Natator depressus | Reptile | 0,163 | EN | 48 |
| Sphyrna mokarran | Shark/ray | 0,147 | EN | 50 |
| Galapagos  (10) | Chelonia mydas | Reptile | 0,514 | EN | 7 |
| Eretmochelys imbricata | Reptile | 0,493 | CR | 11 |
| Arctocephalus galapagoensis | Pinniped | 0,427 | EN | 19 |
| Mobula birostris | Shark/ray | 0,426 | EN | 20 |
| Balaenoptera musculus | Cetacean | 0,407 | EN | 21 |
| Rhincodon typus | Shark/ray | 0,39 | EN | 22 |
| Balaenoptera borealis | Cetacean | 0,369 | EN | 27 |
| Zalophus wollebaeki | Pinniped | 0,346 | EN | 30 |
| Mobula tarapacana | Shark/ray | 0,065 | VU | 60 |
| Dermochelys coriacea | Reptile | 0,064 | VU | 61 |

**Table S2.** List of the top 10 FUSE species per marine province of FRed coldspots (≥ 10 hotspot cells per province).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Province  (N cells) | Species | Higher classification | FUSE | IUCN status | Global FUSE rank |
| Arctic  (493) | Balaenoptera musculus | Cetacean | 0,406 | EN | 21 |
| Eubalaena japonica | Cetacean | 0,368 | EN | 26 |
| Balaenoptera borealis | Cetacean | 0,368 | EN | 27 |
| Hippoglossus hippoglossus | Fish | 0,119 | EN | 52 |
| Hippoglossus stenolepis | Fish | 0,087 | EN | 54 |
| Ursus maritimus | Polar Bear | 0,075203 | VU | 56 |
| Balaenoptera physalus | Cetacean | 0,067126 | VU | 57 |
| Odobenus rosmarus | Pinniped | 0,052481 | VU | 66 |
| Carcharodon carcharias | Shark/ray | 0,049215 | VU | 67 |
| Cystophora cristata | Pinniped | 0,046631 | VU | 68 |
| Continental High Antarctic  (821) | Balaenoptera musculus | Cetacean | 0,406581 | EN | 21 |
| Balaenoptera physalus | Cetacean | 0,067126 | VU | 57 |
| Physeter macrocephalus | Cetacean | 0,032991 | VU | 77 |
| Aptenodytes forsteri | Bird | 0,009649 | NT | 115 |
| Balaenoptera bonaerensis | Cetacean | 0,00675 | NT | 119 |
| Orcinus orca | Cetacean | 0,005826 | NT | 127 |
| Dissostichus mawsoni | Fish | 0,002927 | NT | 162 |
| Lobodon carcinophaga | Pinniped | 0,001351 | LC | 197 |
| Hydrurga leptonyx | Pinniped | 0,000979 | LC | 202 |
| Megaptera novaeangliae | Cetacean | 0,000935 | LC | 206 |
| Antarctic  (299) | Balaenoptera musculus | Cetacean | 0,406581 | EN | 21 |
| Balaenoptera borealis | Cetacean | 0,368844 | EN | 27 |
| Balaenoptera physalus | Cetacean | 0,067126 | VU | 57 |
| Physeter macrocephalus | Cetacean | 0,032991 | VU | 77 |
| Aptenodytes forsteri | Bird | 0,009649 | NT | 115 |
| Balaenoptera bonaerensis | Cetacean | 0,00675 | NT | 119 |
| Orcinus orca | Cetacean | 0,005826 | NT | 127 |
| Dissostichus mawsoni | Fish | 0,002927 | NT | 162 |
| Lobodon carcinophaga | Pinniped | 0,001351 | LC | 197 |
| Hydrurga leptonyx | Pinniped | 0,000979 | LC | 202 |
| Subantarctic Islands  (15) | Balaenoptera musculus | Cetacean | 0,406581 | EN | 21 |
| Balaenoptera physalus | Cetacean | 0,067126 | VU | 57 |
| Physeter macrocephalus | Cetacean | 0,032991 | VU | 77 |
| Aptenodytes forsteri | Bird | 0,009649 | NT | 115 |
| Balaenoptera bonaerensis | Cetacean | 0,00675 | NT | 119 |
| Orcinus orca | Cetacean | 0,005826 | NT | 127 |
| Dissostichus mawsoni | Fish | 0,002927 | NT | 162 |
| Lobodon carcinophaga | Pinniped | 0,001351 | LC | 197 |
| Hydrurga leptonyx | Pinniped | 0,000979 | LC | 202 |
| Megaptera novaeangliae | Cetacean | 0,000935 | LC | 206 |
| Arctic (pelagic)  (82) | Balaenoptera musculus | Cetacean | 0,406581 | EN | 21 |
| Hippoglossus hippoglossus | Fish | 0,119362 | EN | 52 |
| Ursus maritimus | Polar Bear | 0,075203 | VU | 56 |
| Balaenoptera physalus | Cetacean | 0,067126 | VU | 57 |
| Cystophora cristata | Pinniped | 0,046631 | VU | 68 |
| Physeter macrocephalus | Cetacean | 0,032991 | VU | 77 |
| Lamna nasus | Shark/ray | 0,019381 | VU | 95 |
| Orcinus orca | Cetacean | 0,005826 | NT | 127 |
| Hyperoodon ampullatus | Cetacean | 0,003123 | NT | 155 |
| Somniosus microcephalus | Shark/ray | 0,002214 | NT | 181 |
| Scotia Sea  (12) | Balaenoptera musculus | Cetacean | 0,406581 | EN | 21 |
| Balaenoptera physalus | Cetacean | 0,067126 | VU | 57 |
| Physeter macrocephalus | Cetacean | 0,032991 | VU | 77 |
| Aptenodytes forsteri | Bird | 0,009649 | NT | 115 |
| Balaenoptera bonaerensis | Cetacean | 0,00675 | NT | 119 |
| Orcinus orca | Cetacean | 0,005826 | NT | 127 |
| Dissostichus mawsoni | Fish | 0,002927 | NT | 162 |
| Lobodon carcinophaga | Pinniped | 0,001351 | LC | 197 |
| Hydrurga leptonyx | Pinniped | 0,000979 | LC | 202 |
| Megaptera novaeangliae | Cetacean | 0,000935 | LC | 206 |