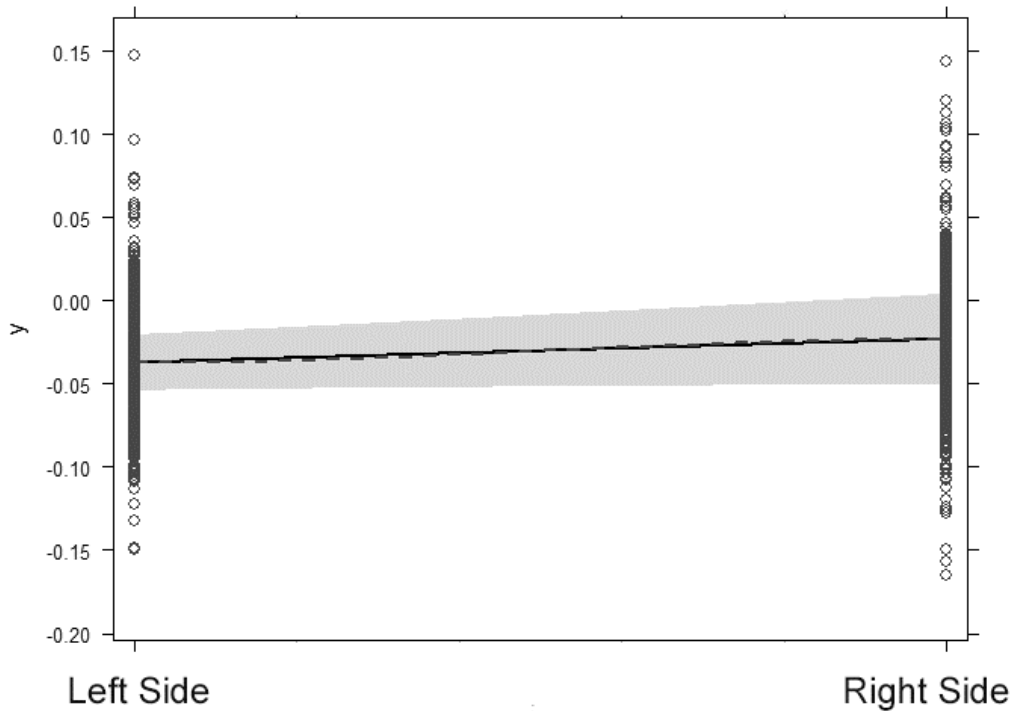


Supplementary Appendix Figure S1: Directional asymmetry between left and right otolith shape at the global scale as estimated by the side effect *SI* in the multivariate mixed-effects model.



Supplementary Appendix Table S1: Average Width/Length ratio for the left and right otoliths at each sampling location.

| Width/Length | Left otolith | Right otolith |
|--------------------|--------------|---------------|
| 1: Tenerife Island | 88.49% | 88.48% |
| 2: Gulf of Oran | 88.75% | 87.45% |
| 3: Gulf of Bejaia | 88.19% | 87.08% |
| 4: Gulf of Annaba | 86.72% | 87.45% |
| 5: Gulf of Tunis | 87.28% | 87.27% |
| 6: Gulf of Lions | 87.45% | 87.46% |
| 7: Corsica Island | 87.45% | 87.45% |
| 8: Ligurian sea | 87.27% | 87.44% |
| 9: Tyrrhenian sea | 87.29% | 87.45% |
| 10: Ionian Sea | 87.49% | 87.47% |
| 11: Aegean Sea | 87.45% | 87.46% |

Supplementary Appendix Table S2 : Jackknifed correct classification matrix of the LDA for left and right otoliths together ($n=560$) between the 11 sampling locations based on the residual shape matrix R_S . The number in each cell represents the number of individuals of the area of origin corresponding to the cell row classified into the predicted area corresponding to the cell

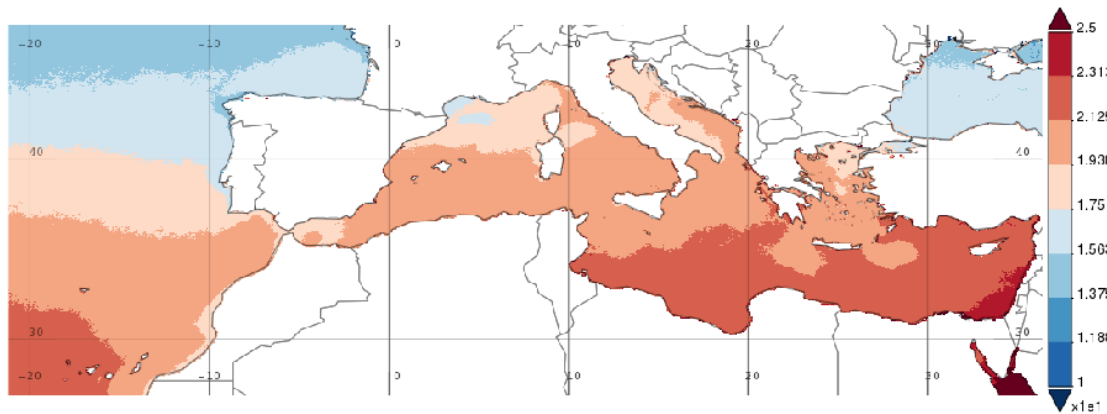
column. The correct classification cells are thus on the main diagonal (shaded). Overall classification success: 39.1% (Wilks' lambda= 0.177, P<0.001).

| | | Predicted Area | | | | | | | | | | | %correct |
|----------------|---------------|----------------|------------|--------------|--------------|-------------|-------------|---------------|----------------|------------------|---------------|---------------|----------|
| | | 1: Tenerife | 2: Oran | 3: Bejaia | 4: Annaba | 5: Tunis | 6: Lions | 7: Corsica | 8: Ligurian | 9: Tyrrhenian | 10: Ionian | 11: Aegean | |
| Actual area | 1: Tenerife | 30 | 1 | 12 | 3 | 9 | 2 | 3 | 2 | 0 | 3 | 2 | 45% |
| | 2: Oran | 2 | 18 | 24 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 38% |
| | 3: Bejaia | 8 | 8 | 67 | 1 | 5 | 1 | 0 | 0 | 0 | 2 | 0 | 73% |
| | 4: Annaba | 4 | 6 | 17 | 9 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 23% |
| | 5: Tunis | 10 | 1 | 0 | 1 | 29 | 1 | 1 | 1 | 2 | 0 | 2 | 60% |
| | 6: Lions | 6 | 1 | 3 | 2 | 4 | 16 | 8 | 7 | 7 | 0 | 0 | 30% |
| | 7: Corsica | 8 | 0 | 1 | 1 | 2 | 15 | 2 | 10 | 2 | 0 | 0 | 5% |
| | 8: Ligurian | 1 | 0 | 1 | 1 | 1 | 7 | 5 | 21 | 21 | 2 | 0 | 35% |
| | 9: Tyrrhenian | 2 | 0 | 0 | 0 | 0 | 5 | 3 | 23 | 16 | 1 | 0 | 32% |
| | 10: Ionian | 6 | 2 | 15 | 0 | 1 | 0 | 2 | 3 | 0 | 6 | 0 | 17% |
| | 11: Aegean | 4 | 0 | 7 | 2 | 5 | 0 | 0 | 3 | 2 | 1 | 3 | 11% |
| | Total | | 81 | 37 | 147 | 23 | 56 | 48 | 25 | 72 | 50 | 15 | 7 |

Supplementary Appendix Table S3: Classification matrix resulting from hierarchical clustering on the residual shape matrix for left otoliths R_S ($n = 560$) between the 11 sampling areas. For each area, the cluster gathering the highest number of individuals is highlighted by a shaded cell.

| Area | Cluster 1 | Cluster 2 | Cluster 3 | Total |
|---------------|-----------|-----------|-----------|-------|
| 1: Tenerife | 59 | 4 | 4 | 67 |
| 2: Oran | 32 | 7 | 8 | 47 |
| 3: Bejaia | 70 | 9 | 13 | 92 |
| 4: Annaba | 23 | 12 | 5 | 40 |
| 5: Tunis | 30 | 10 | 8 | 48 |
| 6: Lions | 20 | 31 | 3 | 54 |
| 7: Corsica | 14 | 25 | 2 | 41 |
| 8: Ligurian | 21 | 32 | 7 | 60 |
| 9: Tyrrhenian | 18 | 30 | 1 | 49 |
| 10: Ionian | 31 | 4 | | 35 |
| 11: Aegean | 16 | 9 | 2 | 27 |
| Total | 334 | 173 | 53 | 560 |

Supplementary Appendix Figure S2: Average annual Sea Surface Temperature (SST) over the studied area from 2013 to 2016 (SeaWiFS Satellite data).



Supplementary Appendix Figure S3: Average annual concentration of chlorophyll-a (Chl-a) over the studied area from 2013 to 2016 (SeaWiFS Satellite data).

