**Table S3.** Total number of ichthyoliths counted by manual observation and those detected by four models trained in this study. Total counts after manual check is also shown.

| sample | slide | Manual count | | | v7x_original_all (#9) | | | v7-x_extended_all (#13) | | | v7-w6_original_all (#10) | | | v7-w6_extended_all (#14) | | | v7x_extended_all + manual check | | | v7-w6_extended_all + manual check | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | tooth | denticle | saw-toothed | tooth | denticle | saw-toothed | tooth | denticle | saw-toothed | tooth | denticle | saw-toothed | tooth | denticle | saw-toothed | tooth | denticle | saw-toothed | tooth | denticle | saw-toothed |
| 576B_03_06_81 | 1 | 17 | 0 | 0 | 32 | 1 | 0 | 19 | 1 | 0 | 18 | 0 | 0 | 17 | 0 | 0 | 15 | 0 | 0 | 17 | 0 | 0 |
| | 2 | 2 | 0 | 1 | 6 | 1 | 1 | 4 | 0 | 1 | 3 | 0 | 1 | 3 | 0 | 1 | 2 | 0 | 1 | 2 | 0 | 1 |
| | 3 | 18 | 1 | 0 | 21 | 1 | 0 | 20 | 1 | 0 | 21 | 1 | 0 | 18 | 1 | 0 | 17 | 1 | 0 | 18 | 1 | 0 |
| | 4 | 7 | 0 | 0 | 13 | 2 | 0 | 10 | 0 | 0 | 10 | 0 | 1 | 10 | 1 | 0 | 8 | 0 | 0 | 8 | 0 | 0 |
| | 5 | 9 | 0 | 0 | 27 | 0 | 3 | 15 | 0 | 2 | 17 | 0 | 2 | 13 | 0 | 2 | 11 | 0 | 0 | 10 | 0 | 0 |
| | 6 | 23 | 1 | 2 | 42 | 1 | 3 | 30 | 1 | 2 | 31 | 1 | 1 | 26 | 1 | 2 | 28 | 1 | 2 | 24 | 1 | 2 |
| | 7 | 19 | 1 | 0 | 32 | 1 | 0 | 25 | 2 | 0 | 27 | 1 | 0 | 23 | 1 | 0 | 20 | 1 | 0 | 22 | 1 | 0 |
| | **Total** | **95** | **3** | **3** | **173** | **7** | **7** | **123** | **5** | **5** | **127** | **3** | **5** | **110** | **4** | **5** | **101** | **3** | **3** | **101** | **3** | **3** |
| 576B_04_02_25 | 1 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 5 | 0 | 0 | 11 | 0 | 0 | 7 | 0 | 0 | 7 | 0 | 0 | 4 | 0 | 0 | 4 | 0 | 0 | 3 | 0 | 0 |
| | 3 | 2 | 0 | 0 | 4 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 3 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 |
| | 4 | 3 | 0 | 0 | 13 | 0 | 1 | 8 | 0 | 0 | 7 | 0 | 0 | 5 | 1 | 1 | 4 | 0 | 0 | 4 | 0 | 0 |
| | 5 | 15 | 1 | 2 | 20 | 1 | 3 | 16 | 0 | 3 | 18 | 1 | 3 | 18 | 0 | 3 | 12 | 0 | 2 | 14 | 0 | 2 |
| | 6 | 19 | 2 | 0 | 37 | 4 | 3 | 23 | 4 | 1 | 23 | 6 | 0 | 21 | 4 | 0 | 19 | 3 | 0 | 21 | 4 | 0 |
| | 7 | 22 | 0 | 0 | 27 | 2 | 0 | 24 | 0 | 0 | 25 | 2 | 1 | 18 | 0 | 1 | 20 | 0 | 0 | 17 | 0 | 0 |
| | 8 | 15 | 1 | 0 | 28 | 1 | 1 | 21 | 1 | 1 | 20 | 2 | 0 | 19 | 1 | 0 | 20 | 1 | 0 | 19 | 1 | 0 |
| | 9 | 22 | 0 | 0 | 47 | 0 | 0 | 31 | 0 | 0 | 35 | 0 | 0 | 27 | 0 | 0 | 26 | 0 | 0 | 24 | 0 | 0 |
| | 10 | 17 | 0 | 0 | 26 | 0 | 1 | 19 | 0 | 1 | 19 | 0 | 2 | 17 | 0 | 1 | 17 | 0 | 0 | 17 | 0 | 0 |
| | **Total** | **120** | **4** | **2** | **216** | **8** | **9** | **151** | **5** | **6** | **156** | **13** | **6** | **132** | **6** | **6** | **124** | **4** | **2** | **121** | **5** | **2** |
| 576B_04_04_75 | 1 | 12 | 0 | 0 | 18 | 0 | 0 | 14 | 0 | 0 | 13 | 1 | 0 | 12 | 0 | 0 | 9 | 0 | 0 | 9 | 0 | 0 |
| | 2 | 9 | 0 | 1 | 17 | 1 | 1 | 13 | 1 | 1 | 11 | 2 | 1 | 6 | 0 | 1 | 9 | 0 | 1 | 6 | 0 | 1 |
| | 3 | 26 | 2 | 1 | 39 | 5 | 2 | 25 | 4 | 1 | 30 | 5 | 2 | 25 | 3 | 1 | 24 | 2 | 1 | 23 | 2 | 1 |
| | 4 | 32 | 1 | 0 | 48 | 7 | 1 | 30 | 4 | 1 | 37 | 3 | 1 | 25 | 3 | 0 | 24 | 1 | 0 | 21 | 1 | 0 |
| | 5 | 44 | 3 | 0 | 93 | 5 | 2 | 59 | 3 | 0 | 70 | 3 | 0 | 50 | 2 | 0 | 50 | 3 | 0 | 47 | 2 | 0 |
| | 6 | 69 | 2 | 0 | 120 | 2 | 2 | 77 | 1 | 2 | 82 | 2 | 1 | 73 | 1 | 1 | 70 | 1 | 0 | 68 | 1 | 0 |
| | 7 | 39 | 0 | 0 | 69 | 0 | 0 | 48 | 0 | 0 | 55 | 1 | 0 | 43 | 0 | 0 | 43 | 0 | 0 | 41 | 0 | 0 |
| | 8 | 45 | 0 | 0 | 61 | 2 | 0 | 46 | 0 | 0 | 53 | 2 | 0 | 37 | 2 | 0 | 43 | 0 | 0 | 37 | 0 | 0 |
| | 9 | 56 | 1 | 1 | 85 | 2 | 1 | 60 | 1 | 1 | 72 | 1 | 1 | 57 | 2 | 1 | 53 | 1 | 1 | 54 | 1 | 1 |
| | 10 | 108 | 1 | 0 | 142 | 1 | 1 | 99 | 1 | 1 | 117 | 3 | 0 | 86 | 1 | 1 | 91 | 1 | 0 | 80 | 1 | 0 |
| | 11 | 51 | 0 | 0 | 82 | 0 | 0 | 55 | 0 | 0 | 57 | 0 | 0 | 45 | 0 | 0 | 51 | 0 | 0 | 43 | 0 | 0 |
| | **Total** | **491** | **10** | **3** | **774** | **25** | **10** | **526** | **15** | **7** | **597** | **23** | **6** | **459** | **14** | **5** | **467** | **9** | **3** | **429** | **8** | **3** |
| **RMSPE** | | - | - | - | 42.8% | 74.7% | 147.1% | 13.3% | 29.0% | 83.1% | 16.7% | 86.6% | 77.8% | 6.6% | 24.1% | 73.7% | 3.3% | 9.0% | 0% | 4.7% | 10.7% | 0% |