

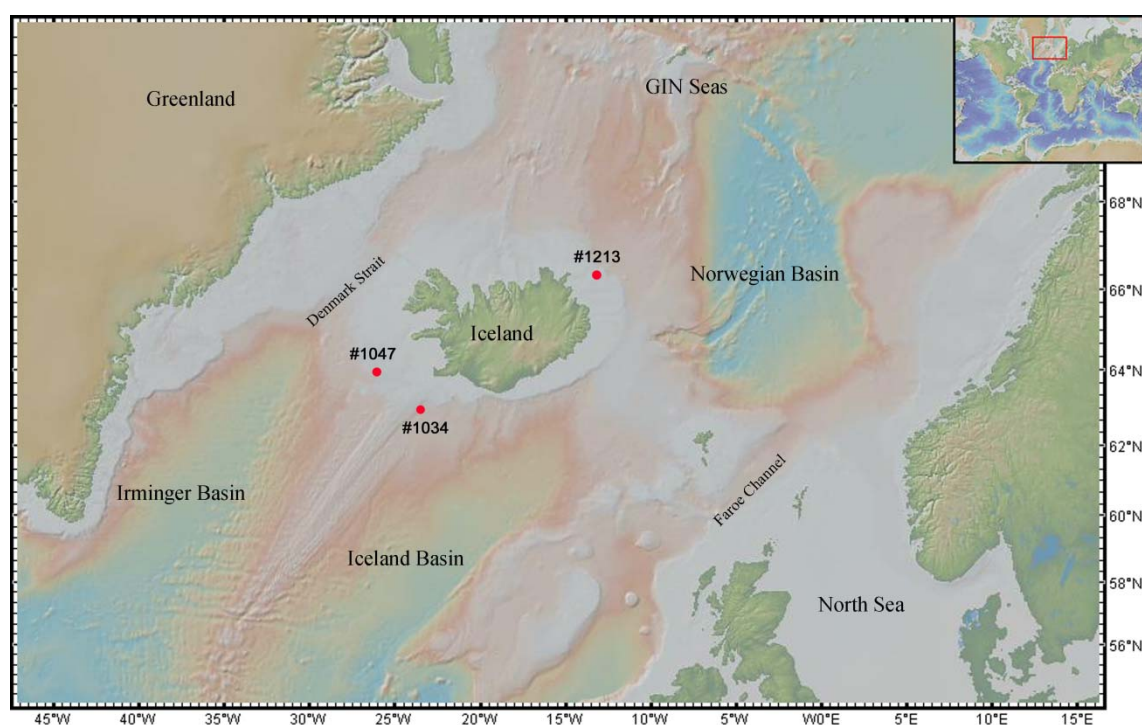
# Detecting hybridization between sister species of *Terebratulina* (Brachiopoda, Cancellothyridoidea) in the North Atlantic: morphology *versus* molecules

Carsten Lüter\*, Nina A. Ebeling, Martin Aberhan

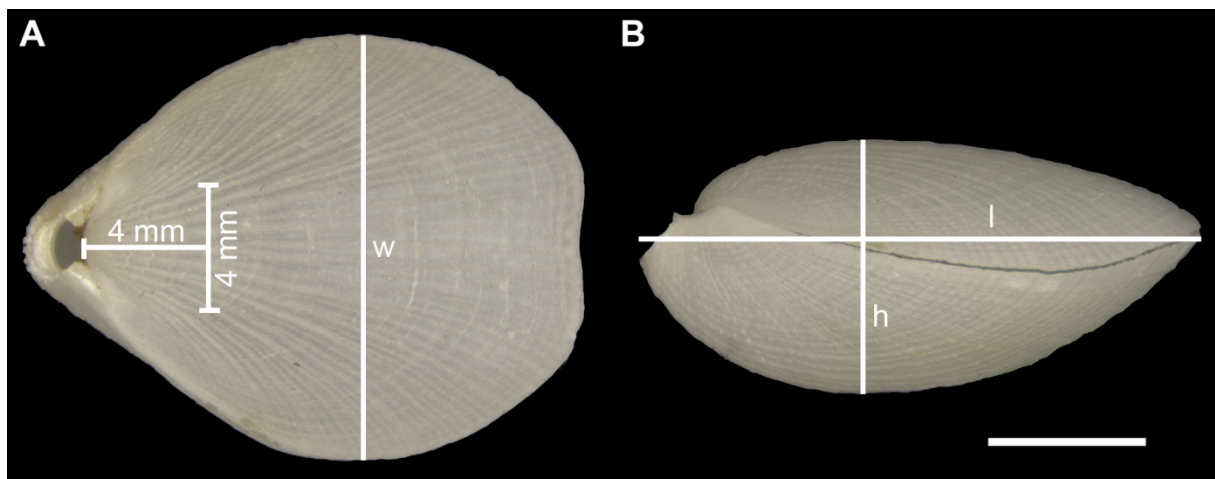
Museum für Naturkunde, Leibniz Institute for Evolution and Biodiversity Science,  
Invalidenstraße 43, 10115 Berlin, Germany

\* corresponding author

## Supplementary information



**Supplementary Figure S1.** Map of the sampling area of the IceAGE expedition (Me85/3) with RV METEOR in September 2011. Red dots represent the three stations where specimens of *Terebratulina* were collected. For details of the Agassiz-trawl stations see Supplementary Table 1. (Map redrawn from [S1], courtesy of Saskia Brix-Elsig).



**Supplementary Figure S2.** Dorsal (A) and lateral (B) views of a shell of *Terebratulina retusa* (ZMB Bra 2421) showing dimensions and positions of measurements used for the morphometric analysis (see text for details). All measurements were taken according to the descriptions in Curry & Endo (see Figs. 1, 2 in [16]) to enable direct comparison with their previous data set. w, shell width; h, shell height; l, shell length; scale bar: 5 mm.

**Supplementary Table S1.** Coordinates of the three stations at which specimens of *Terebratulina* were collected during the cruise IceAGE (Me85/3) in September 2011.

| Station     | #1034                             | #1047                            | #1213                     |
|-------------|-----------------------------------|----------------------------------|---------------------------|
| Location    | S Iceland, Reykjanes Ridge, shelf | S Iceland, Irminger Basin, shelf | NE Iceland, Norwegian Sea |
| Date        | 4 Sep 2011                        | 6 Sep 2011                       | 22 Sep 2011               |
| Depth (m)   | 297.2                             | 209.4                            | 318.2                     |
| Coordinates | 63°19.48'N,<br>23°9.83'W          | 63°56.07'N,<br>25°56.53'W        | 66°33.16'N,<br>12°53.40'W |

**Supplementary Table S2.** Provenance of additional specimens from the brachiopod dry collection of Museum für Naturkunde, Berlin used for morphometrical analyses.

| Accession no. | No. of specimens | Locality            | Ocean         |
|---------------|------------------|---------------------|---------------|
| ZMB Bra 334   | 1                | Maine, USA          | NW Atlantic   |
| ZMB Bra 1305  | 1                | Casco Bay, USA      | NW Atlantic   |
| ZMB Bra 1440  | 4                | Nova Scotia, Canada | NW Atlantic   |
| ZMB Bra 1433  | 1                | Labrador, Canada    | NW Atlantic   |
| ZMB Bra 1454  | 1                | Greenland, Denmark  | N Atlantic    |
| ZMB Bra 1432  | 1                | Finnmarken, Norway  | NE Atlantic   |
| ZMB Bra 237   | 3                | Finnmarken, Norway  | NE Atlantic   |
| ZMB Bra 238   | 3                | Finnmarken, Norway  | NE Atlantic   |
| ZMB Bra 1338  | 1                | Naples, Italy       | Mediterranean |

**Supplementary Table S3.** Markers and their respective primer sequences used in PCR reactions.

| Gene | Primer  | Primer sequence                                        | Reference            |
|------|---------|--------------------------------------------------------|----------------------|
| 12S  | F 1091  | 5'- AAA AAG CTT CAA ACT GGG ATT AGA TAC CCC ACT AT -3' | [47]                 |
|      | R 1478  | 5'- TGA CTG CAG AGG GTG ACG GGC GGT GTG T -3'          | [47]                 |
| 16S  | F 16Sar | 5'- CGC CTG TTT AAC AAA AAC AT -3'                     | [48]                 |
|      | R 16Sbr | 5'- CCG GTC TGA ACT CAG ATC ACG T -3'                  | [48]                 |
| 28S  | F 680   | 5'- ACC CGC TGA AYT TAA GCA TAT CA -3'                 | BL Cohen pers. comm. |
|      | F 700   | 5'- GCA TAT CAA TAA GCG GAG GAA AAG AAA C -3'          | [49, 50]             |
|      | F 1062  | 5'- CGT GAA ACC GYT YAG AGG CAA ACG -3'                | BL Cohen pers. comm. |
|      | R 1460  | 5'- AGA CTC CTT GGT CCG TGT TTC AAG AC -3'             | BL Cohen pers. comm. |
|      | R 1797  | 5'- GCT ATC CTG AGG GAA ACT TCG G -3'                  | [50]                 |

**Supplementary Table S4:** List of all specimens subject to molecular analyses with ZMB catalogue number, species identification (based on sequence information), collecting station, and Genbank accession numbers. Note that the hybrids (ZMB Bra 2428 and 2429) are labeled as crossbreeds between the two species *T. retusa* and *T. septentrionalis*.

| ZMB cat. no. | Species                            | Station # | Genbank accession numbers |          |          |
|--------------|------------------------------------|-----------|---------------------------|----------|----------|
|              |                                    |           | 12S rRNA                  | 16S rRNA | 28S rRNA |
| ZMB Bra 2415 | <i>T. retusa</i>                   | 1034      | MF595951                  | MF619899 | MF619926 |
| ZMB Bra 2416 | <i>T. retusa</i>                   | 1034      | MF595952                  | MF619900 | MF619927 |
| ZMB Bra 2417 | <i>T. retusa</i>                   | 1034      | MF595953                  | MF619901 | MF619928 |
| ZMB Bra 2418 | <i>T. retusa</i>                   | 1047      | MF595954                  | MF619902 | MF619929 |
| ZMB Bra 2419 | <i>T. retusa</i>                   | 1047      | MF595955                  | MF619903 | MF619930 |
| ZMB Bra 2420 | <i>T. retusa</i>                   | 1047      | MF595956                  | MF619904 | MF619931 |
| ZMB Bra 2421 | <i>T. retusa</i>                   | 1047      | MF595957                  | MF619905 | MF619932 |
| ZMB Bra 2422 | <i>T. retusa</i>                   | 1047      | MF595961                  | MF619909 | MF619933 |
| ZMB Bra 2423 | <i>T. retusa</i>                   | 1047      | MF595962                  | MF619910 | MF619934 |
| ZMB Bra 2424 | <i>T. retusa</i>                   | 1047      | MF595963                  | MF619911 | MF619935 |
| ZMB Bra 2425 | <i>T. retusa</i>                   | 1047      | MF595964                  | MF619912 | MF619936 |
| ZMB Bra 2426 | <i>T. retusa</i>                   | 1047      | MF595965                  | MF619913 | MF619937 |
| ZMB Bra 2427 | <i>T. retusa</i>                   | 1047      | MF595959                  | MF619907 | -        |
| ZMB Bra 2428 | <i>T. retusa</i> x <i>T. sept.</i> | 1047      | MF595958                  | MF619906 | MF619941 |
| ZMB Bra 2429 | <i>T. retusa</i> x <i>T. sept.</i> | 1047      | MF595960                  | MF619908 | MF619942 |
| ZMB Bra 2430 | <i>T. septentrionalis</i>          | 1047      | MF595967                  | MF619915 | MF619939 |
| ZMB Bra 2431 | <i>T. septentrionalis</i>          | 1047      | MF595968                  | MF619916 | MF619940 |
| ZMB Bra 2432 | <i>T. septentrionalis</i>          | 1034      | MF595966                  | MF619914 | MF619938 |
| ZMB Bra 2433 | <i>T. septentrionalis</i>          | 1047      | MF595969                  | MF619917 | MF619943 |
| ZMB Bra 2434 | <i>T. septentrionalis</i>          | 1047      | MF595970                  | MF619918 | MF619944 |
| ZMB Bra 2435 | <i>T. septentrionalis</i>          | 1213      | MF595971                  | MF619919 | MF619945 |
| ZMB Bra 2436 | <i>T. septentrionalis</i>          | 1213      | MF595972                  | MF619920 | MF619946 |
| ZMB Bra 2437 | <i>T. septentrionalis</i>          | 1213      | MF595973                  | MF619921 | MF619947 |
| ZMB Bra 2438 | <i>T. septentrionalis</i>          | 1213      | MF595974                  | MF619922 | MF619948 |
| ZMB Bra 2439 | <i>T. septentrionalis</i>          | 1213      | MF595975                  | MF619923 | MF619949 |
| ZMB Bra 2440 | <i>T. septentrionalis</i>          | 1213      | MF595976                  | MF619924 | MF619950 |

### Supplementary References

- S1 Brix, S. et al. The IceAGE project – a follow up of BIOICE. *Pol. Polar Res.* **35**, 141-150 (2014).