The non-native Japanese skeleton shrimp, Caprella mutica, has successfully established thriving populations on artificial structures in European coastal waters. Densities may reach several 10,000 to 100,000 individuals m\(^{-2}\).

Prior to the arrival of C. mutica at Helgoland (German Bight, North Sea), its European congener, Caprella linearis, was regularly found in densities of approx. several 1,000 to 10,000 individuals m\(^{-2}\) on artificial structures of Helgoland’s harbours, e.g. pontoons and marina constructions. The nowadays overall absence of C. linearis from these structures is hypothesised to be the outcome of a competitive interaction with C. mutica.

In the present study, the outcome and mechanism of density dependent competition for space between C. linearis and C. mutica was studied in laboratory-based aquarium trials.

The two species were placed together in 1 ltr aquarium tanks on a plastic mesh of 50 cm\(^2\) to test for an interspecific effect of one species on the other (N = 5).

Two experimental densities were chosen representing actual numbers in the field: 
- **low (5)** = 1,000 ind. m\(^{-2}\) and 
- **high (50)** = 10,000 ind. m\(^{-2}\).

Data ascertainment after 24 h of interaction:
- The number of:
  - Remains on mesh (persistence)
  - Survivors & dead (displacement)

**Density combinations:**

<table>
<thead>
<tr>
<th>Density treatments</th>
<th>C. linearis</th>
<th>C. mutica</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ 0</td>
<td>+ 5</td>
<td>+ 50</td>
</tr>
<tr>
<td>+ 5</td>
<td>+ 0</td>
<td>+ 50</td>
</tr>
<tr>
<td>+ 50</td>
<td>+ 0</td>
<td>+ 5</td>
</tr>
</tbody>
</table>

**Remains on mesh (persistence)**

- **C. mutica** was never affected by C. linearis
- **C. linearis** was increasingly displaced by aggressive and predaceous behaviour of C. mutica when densities increased
- The mechanism of displacement is direct interference (interference competition)
- C. mutica suffers from high intrinsic mortality (largely not affected by C. mutica, but probably because of low stress tolerance)

To explain the decline of remaining C. linearis and, thus, the displacement of natives by the non-native, we ask: what happened with those C. linearis not on mesh?

**Survivors & dead (displaced)**

- Alive
- Dead, visible
- Dead, missing
- Predation ?

**Density treatments (absence and presence of low and high numbers of C. mutica)**

<table>
<thead>
<tr>
<th>Density treatments</th>
<th>0</th>
<th>5</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Share of C. linearis</td>
<td>20</td>
<td>30</td>
<td>40</td>
</tr>
</tbody>
</table>

The results give strong indication, that over time or even with higher densities of C. mutica, C. linearis will vanish from the meshes entirely. Therefore, the nowadays overall absence of C. linearis from space-limited artificial structures around Helgoland’s harbours probably is the outcome of a competitive encounter with C. mutica.

While C. mutica is rather scarce in natural habitats as opposed to artificial structures, competitive encounters between the two species may be reduced in such habitats. However, because of the rather few and patchy occurrences C. linearis populations in natural habitats, the overall persistence of C. linearis in the southern North Sea may be at higher risk than previously assumed.