The process of the thermal and osmotic acclimatisation of the marine invertebrates, which posses osmoregulatory abilities, is more complicated. In this case, the osmotic resistance and *the osmoregulatory performance* depend largely upon the acclimatisation temperature. We have used the shrimp, *Crangon vulgaris*, in experiments with various temperatures and salinities[9]. In high and low salinities, the euryhaline shrimps are osmotically more resistant at low temperatures (Fig. 3). For a temperature range from 5° to 15°C, the optimal salinity of *Crangon* lies approximately between 15 and 30‰ salinity. At 20°C the resistance area or 'the zone of tolerance' is much smaller than at 15° and 5°C. These observations do not confirm earlier hypothetical conclusions[10] that for 2-year-old shrimps the optimum salinity decreases with a fall in temperature below 21°C. If, however, one reduces the temperature of the external medium below 3°C, the osmotic resistance of *Crangon* decreases more rapidly as the temperature approaches zero. The osmoregulation of *Crangon* in brackish water apparently functions sufficiently only within a middle temperature range, between 5° and 15–20°C.

In order to analyse the influence of the temperature upon the osmoregulation of *Crangon*, we determined the freezing point depression of the blood and the external medium at 5°, 10°, and 15°C. Figure 4 shows that sea water at 27‰ salinity is nearly isotonic with long-acclimatised individuals. The difference in the freezing points of the internal and external medium is very small in this case, and is possibly not caused by any activity of the animal. At all salinities of the external medium as applied by us, the osmoregulatory performance was observed to be strongest at 5° and not at 15°C.

At temperatures below 5°C, during which, as has already been pointed out, *Crangon* in brackish water survives only with difficulty, the osmoregulatory performance also decreases! It is not easy fully to demonstrate this decrease in the osmoregulatory performance at 2·5° or 1°C. During the first days, the osmoregulatory performance decreases only slowly, and then breaks down after a certain amount of time. When this happens, the animals will die quickly. If the animals in our experiments, for instance at 1°C, after a certain amount of time, were plainly weakened in their motions and reactions, then the concentration of the blood had always greatly decreased. These observations are contradictory to the previous data by BROEKEMA[10], according to which in all cases *Crangon* in warm brackish water is supposed to show a greater osmoregulatory performance than in colder water. But BROEKEMA has measured the electrical conductivity of the blood of *Crangon*. She therefore determined only salinity changes, not the osmotic changes due to organic molecules. We used the method of freezing point depression which gives more reliable figures for the osmotic concentration. We conclude that the shrimps are unable to live in brackish estuarine waters of low salinity in winter, because their osmoregulation breaks down at temperatures below 3°C. Furthermore, we believe that our observations show that one cannot explain the heavy immigration of marine invertebrates into tropical warm brackish waters simply by the hypothesis that osmoregulation is, on the whole, easier in a warmer medium[11,12].

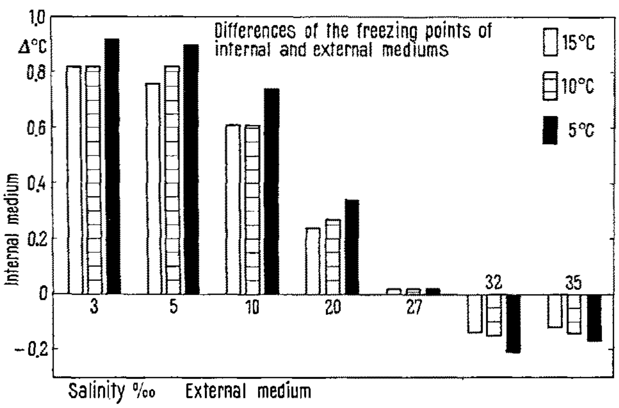

Fig. 4. The osmoregulatory performance of the shrimp *Crangon vulgaris* at various temperatures after acclimatisation in waters of different salinities.

Zusammenfassung

Das Ausmass des Temperaturbereiches mariner Arten ist in erster Linie durch erbliche zellphysiologische Eigenschaften bedingt. An isolierten Gewebestücken mariner Bodenevertebraten aus kaltem Tiefenwasser und aus wärmeren oberflächlichen Schichten lässt sich dementsprechend zeigen, dass ihr genotypischer thermischer Resistenz- und Leistungsbereich quantitativ verschieden ist und bei stenothermen Arten auch nicht individuell phänotypisch verändert werden kann.

Der Umfang des Salzgehaltsbereiches stenohaliner und euryhaliner Arten ist ebenfalls in erster Linie zellulär genetisch bedingt. Jedoch beruhen thermische und osmotische Resistenz auf verschiedenen zellphysiologischen Mechanismen. Nur bei euryhalinen Formen lösen Veränderungen der Salzkonzentration des Aussenmediums individuelle zelluläre Resistenz- und Leistungsverschiebungen aus.

Niedere Temperaturen begünstigen innerhalb des artspezifischen thermischen Resistenzbereiches Anpassung an extrem niedrige und hohe Salzkonzentrationen.

Die starke Einwanderung mariner Arten in tropische Brackwässer kann nicht durch die Annahme erklärt werden, dass die Osmoregulation in der Wärme leichter ist.

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[11] C. SCHLIEPER, Int. Oceanograph. Congress, New York (1959), Preprints, p. 250.

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CORRIGENDUM

R. JAQUES and R. MEIER: *Pharmacological Characteristics of Bradykinin B.* Exper. vol. XVI, fasc. 8, p. 371 (1960).

The first sentence of the results (p. 371, left, 11th line from below) should read: A: 1. The isolated terminal guinea-pig ileum contracted upon addition of bradykinin B in final concentrations as low as 1 to 3 × 10^{-12} (g/l), i. e. 1 to 3 ng/ml.