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**DESCRIPTION OF ARRAY MORPHOLOGY OF THE
LATERAL LINE SYSTEM IN FISH FROM DIFFERENT
HABITATS**

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EXECUTIVE SUMMARY

The array morphology of the lateral line system in two more cyprinid species with different habitat preferences was investigated: the rheophilic minnow (*Phoxinus phoxinus*) and the indifferent ide (*Leuciscus idus*), the golden ide variety in our case. We used vital staining methods (methylene blue and DASPEI) to evaluate the numbers and distribution of canal neuromasts (CN) and superficial neuromasts (SN). In addition scanning electron microscopy and fluorescence labeling was used to investigate the ultrastructure and orientation of neuromasts in different body regions.

The total number of SN per body side is 1001 in the ide and 909 in the minnow. In all body parts number of SN differed between the two species. The minnow had more SN on the head whereas numbers on trunk and tail fin were greater in the ide. The number of CN was different on head and trunk, the ide having more CN on the head (59 compared to 38 in the minnow), and the minnow having more CN on the trunk (72 vs. 59).

SN on the trunk were arranged in dorso-ventral rows in both species. Differences occurred regarding the distribution of the SN. The minnow possessed very small scales covered by a thick epidermis. Along the lateral line, SN groups (SN that are arranged in clusters, spatially separated from other clusters) were situated on lateral line scales and directly above or below the lateral line, whereby groups most often covered more than one scale. 38% of all SN were arranged in this way, whereas 5% of all SN were situated on the dorsal part of the trunk. In the ide, however, SN groups were always linked to scales. 29% of all SN were arranged on the lateral line scales and 21% on the dorsal part of the trunk. The minnow had more groups of SN on the trunk (100 compared to 59), whereas the ide has more groups of SN above the lateral line (59 compared to 18). The mean number of SN per group was greater in lateral line groups than in the remaining trunk groups and was greater for ide than for minnow.

The axis of best sensitivity of the hair cells was perpendicular to the long axis of SN and CN in both species. The mean number of hair cells in SN was 34.6 in the ide and 28.0 in the minnow, while in CN mean hair cell number was 139 and 111, respectively.

The distribution of SN orientation differed between species and between distinct body regions. In both species, however, hair cell polarization of most SN was rostro-caudal on the lateral line scales (80% and 76%, in ide and minnow, respectively) and on the tail fin (92% and 96%). In contrast, hair cell polarization was mainly dorso-ventral on the dorsal trunk area in minnow (67%), but only 40% in the ide. In the latter species 51% of SN were oriented rostro-caudal. On the head, all orientations occurred, but there was a focus on the rostro-caudal and dorso-ventral orientation with differences between the species. Detailed analysis of the orientation of groups of SN revealed that in more than 90% in both species orientation was identical with less than 45° between individual SN. SN with orthogonal orientation in the same group occurred in 22% and 10% of the SN groups in ide and minnow, respectively.

Comparison of the data with the data for the limnophilic goldfish and bitterling and the rheophilic indifferent gudgeon showed differences in number, distribution and orientation of SN. A specific lateral line design correlated with coarse habitat preference/lifestyle is not apparent. Number of SN per group is highest in the limnophilic species and lowest in the rheophilic species. Number of hair cells per SN is lowest in the limnophilic species and highest in the indifferent species indicating a relation between ultrastructure and coarse habitat.