## IMPACT OF ZANDER STOCKING ON PERCH AND PIKE IN A MESOTROPHIC LAKE.

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**Introduction** Top down control of pelagic food webs was assumed to be strongest in mesotrophic lakes but empirical evidence to support this assumption is rare. To compare the interaction intensity within pelagic food webs in a mesotrophic lake before and after manipulation of the piscivorous level, the pelagic and night active species zander (*Sander lucioperca* (L.)) was additionally stocked into a lake inhabited by perch (*Perca fluviatilis* L.) and pike (*Esox lucius* L.). By comparison of feeding pressure and habitat choice of fish in the period before (1997/98) and after zander stocking (2001/02), the response of ecosystem structure was investigated. In this work first results of the influence of zander introduction on the ecology of the perch and pike populations is presented.

**Methods.** Mesotrophic Lake Großer Vätersee (12 ha, max. depth 11.5 m) is situated in north eastern Germany. In 1997/98, roach (*Rutilus rutilus* (L.)) and perch were the dominant non-predatory species (Haertel *et al.* 2002). Predatory fish were pike and large perch. Population estimates from mark-recapture surveys in 1998 for pike and perch were 156 kg and 96 kg, respectively. Fish were caught by electric fishing in both periods and with gill nets in the with-zander period. Mesh sizes used were 25, 32, 40 and 50 mm. Nets were set at day, twilight and night and different depths. In both periods stomach contents were obtained by stomach flushing. Prey biomass was recalculated from stomach remains. To double the biomass of piscivorous fish and to introduce a pelagic and night active predator, 719 (182 kg) and 301 (100 kg) age-2 zander (mean total length 31 ± 4 cm standard deviation) were stocked in spring 2001 and 2002, respectively.

**Results.** During the zander-free period it was found that pike were mainly restricted to the littoral zone throughout the whole day. Perch were mainly found in the pelagic area during day and were inactive during night. From 45 perch caught during daytime, 88% were caught in the pelagic zone. After stocking with zander, pike still inhabited the littoral zone. Results from gill net catches showed that pike were most active during day but catch per unit effort (CPUE) was low (Figure 1). No pike were caught at night. After stocking with zander, CPUE of perch was highest during day and no perch were caught at night. CPUE were similar for all depths during daytime indicating that perch were evenly distributed in all habitats. During twilight, CPUE in the surface net was low. CPUE of zander was highest during twilight and zander were also caught at night. During twilight CPUE was generally highest at depths more distant from the shoreline.

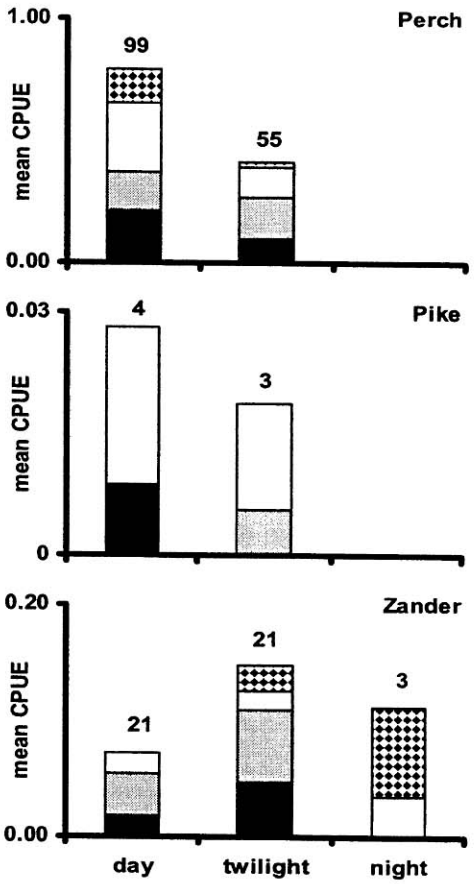


Figure 1. CPUE (numbers) in gill nets set at different depths of perch, pike and zander in Lake Großer Vätersee in 2002. ⊠ surface, ☐ 3 m, ☐ 6 m, ■ 8 m,. Figures above columns indicate fishes caught. Please notice differences in y-axes scale.

Stomach contents of perch (wet weight) was dominated by roach and *Orconectes limosus* during the zander-free period (Figure 2), whereas perch was rarely eaten. In response to zander stocking, there was a shift in prey dominance of piscivorous perch

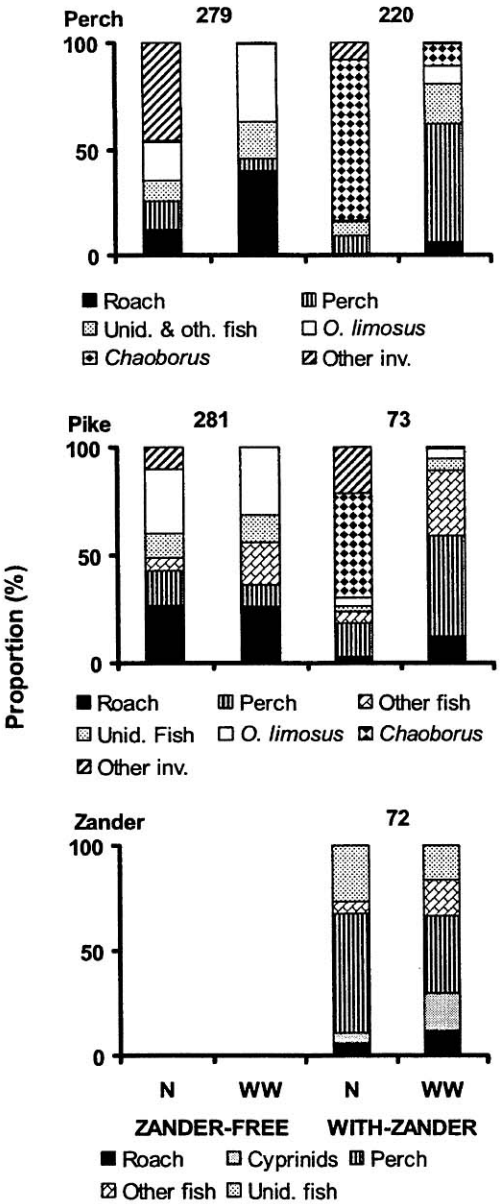


Figure 2. Composition of stomach contents by numbers (N) and by wet weight (WW) for 'zander-free' and 'with-zander period'. Unid.= unidentified; Oth.= other. Inv.= invertebrates. Figures above columns indicate numbers of stomachs analysed.

towards strong cannibalism on YOY perch. In addition, *O. limosus* was largely replaced by *Chaoborus*.

Pike fed mainly on roach and other fish species except for perch and *O. limosus* during the zander-free period. In contrast, during the with-zander period, dominant prey were perch and other fish species. Zander fed mainly on perch and cyprinids.

**Discussion.** In the present study, clear changes in habitat choice of perch and in the diet of perch and pike have been observed in response to stocking with a night-active pelagic predator. In contrast, no changes in pike activity and habitat choice became visible. This may support the assumption that competition by introduced zander was stronger on the pelagic piscivorous perch than on the more littoral living pike.

Diet composition of pike and perch showed a decrease in the proportion of roach and *O. limosus* and an increase in perch and *Chaoborus*. The antagonistic shift between roach and perch may reflect a change in habitat choice of roach. Whereas roach were exclusively caught in the littoral zone during the zander-free period at daytime, at night more than 90% of roach were caught in the pelagic zone (Haertel *et al.* 2002). A different image was found during the period after zander stocking (Dörner, unpublished data). In those years, roach showed a less clear diel pattern of habitat choice and was found both in the pelagic and the littoral zone during night. During day, however, roach was still caught at high proportions in the littoral zone. Much lower pelagic CPUE of roach in this period as compared to 1997 and 1998 is caused by a behavioural response of the roach population as abundance of roach has not severely altered between both periods. This indicates that behaviour of roach was altered by the nightly activity of zander in the pelagic. Furthermore, a simulation with an individual-based model revealed that roach consumed pelagic plankton prey to a much lower extent if diel migrations were stopped (Hölker *et al.* 2002) which is expected to impact substantially the whole pelagic food web. The trophic changes in response to zander stocking will be analysed by means of a bioenergetic model and mark recapture data to address whether the trophic interactions are indeed strongest at meso-trophic conditions.

**Acknowledgements.** The study was financed by the German Research Council (DFG, EC 146/2-1+2 and ME 1686/4-1+2).

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