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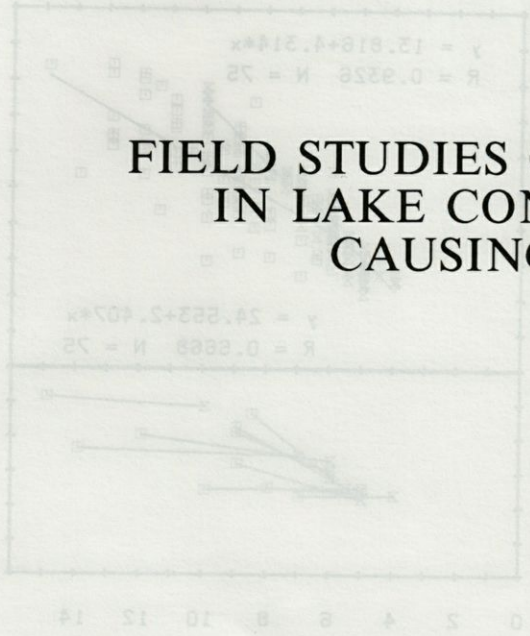
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FIELD STUDIES ON EEL (*ANGUILLA ANGUILLA*) IN LAKE CONSTANCE : TAGGING EFFECTS CAUSING RETARDATION OF GROWTH

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MARQUAGE
CROISSANCE
ANGUILLA
EAUX CONTINENTALES

RÉSUMÉ. — Les otolithes d'Anguilles recapturées 7 ans après leur marquage, sont utilisés pour calculer la croissance annuelle. Le ralentissement de croissance causé par le marquage s'élève approximativement à 50 %. Par rapport à la croissance moyenne annuelle qui est de 48 mm pour les Anguilles non marquées, celle des Anguilles marquées est estimée à 24 mm. En relation avec les différents types de réactions dus à la pose d'une marque sur l'opercule, les données de croissance varient largement. Dans certains cas, il n'y a pas de retard de croissance, dans d'autres, le retard de croissance dure un temps limité, suivi d'une croissance non perturbée, et dans un troisième cas, on observe une réduction de croissance pendant toute la période du marquage. Ces résultats démontrent clairement que la fiabilité d'une étude de croissance par marquage se révèle limitée.

TAGGING
GROWTH
ANGUILLA
INLAND WATERS

ABSTRACT. — Otoliths of eels recaptured up to 7 years after tagging were used for the calculation of the annual growth of tagged eels. The growth reduction caused by the tagging runs to approximately 50 %. In contrast to the mean annual length increments of about 48 mm for untagged eels the average annual growth of tagged eels was calculated to 24 mm. Resulting from different types of reaction to the jaw-tags the growth data of eels varied widely. In some cases there was no distinguishable growth retardation, in other cases the growth retardation lasted a limited time followed by undisturbed growth and in a third type the tagging led to growth reduction over the whole tagging period. In these results the limited reliability of growth data derived from tagging experiments is clearly shown.

In the course of an extensive study based on tagged eels in Lake Constance (Bodensee) the reduction of growth was observed. There is practically no information about the extend of growth to be one of the effects of tagging retardation on eel (*Anguilla anguilla* L.) effected by marking with jaw tags.

The study was made on a total of 8.726 tagged eels in Lake Constance, a large prealpine lake with two major basins : Lake Obersee (476 km²) a deep, cool and mesotrophic lake and the eutrophic Lake Untersee (63 km²) with a mean depth of 13 m and large shallows covering an area of 44 km². The eels were caught by various methods adjusted to the

different habitats with the aim of taking a random sample. By using a special pair of tongs to fix the jaw-tags in the corner of the mouth tagging was effected with a minimum of handling. Most of the tagged eels lived in Lake Constance for 3 to 7 years until their final capture.

As a first step the annual growth was measured *in-situ* on eels which were recaptured several times. Plotted against the period of liberty in the lake an average annual increment of 2.4 cm was found for time intervals up to 1.000 days (figure 1). There have been no significant changes with higher periods of liberty. In contrast to the mean annual length incre-

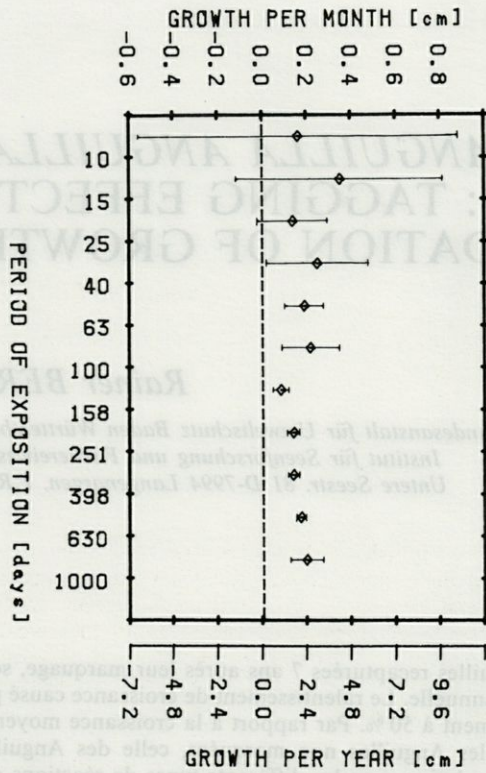


Fig. 1. — *In-situ* growth of tagged eels against the time of liberty in Lake Constance. Vertical lines : 95 % confidence limits.

ments of 48 mm for untagged eels (Berg, 1985), the average annual growth of tagged eels was reduced to approximately 50%. Resulting from different types of reaction to the jaw-tagging the growth datas of the eels were widely spread : in some cases there was no distinguishable growth retardation, in other cases the growth retardation lasted a limited time followed by undisturbed growth and in a third type of case the tagging led to growth reduction over the whole tagging period.

By assuming the location of false annuli caused by the tagging procedure it was possible to show the time of first tagging in a thin section of the otolith (Berg 1985). Supported by this method, the length

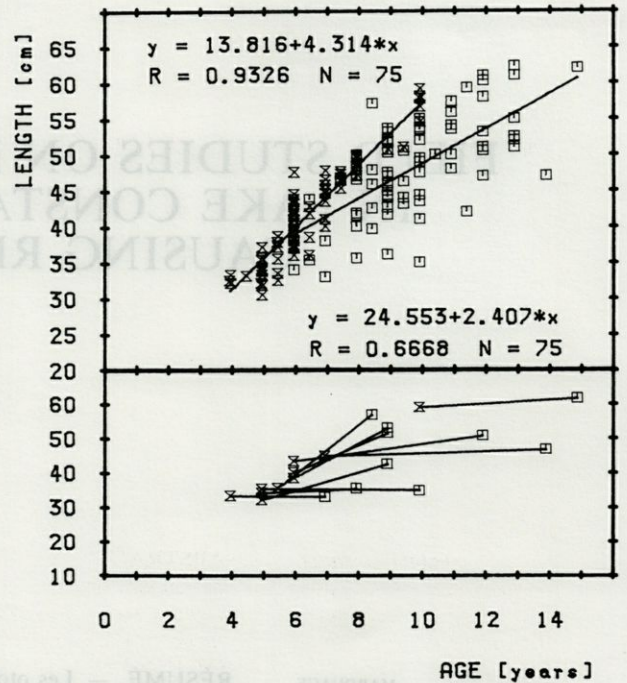


Fig. 2. — Length-age-relation data of tagged and untagged eels. X : Data representing age at time of tagging. □ : Data after final capture of the tagged eels. Below : Different patterns of growth between the time of tagging and the final capture.

on age relation at the time of tagging and after final capture if plotted in figure 2. The values of the length on age relation after final capture are much lower.

All things considered the jaw tagging led to a considerable reduction of growth. However, using the changed relations in otolith ring pattern it became possible to made allowance for the changed growth situations.

LITERATURE

BERG R., 1985. Age determination of eels *Anguilla anguilla* (L.) : comparison of field data with otolith ring patterns. *J. Fish Biol.*, 26 : 537-544.

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