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Short communication

Old timers from the Baltic Sea: Revisiting the population structure and maximum recorded age of ide *Leuciscus idus*

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ABSTRACT

Population age structure of ide *Leuciscus idus* in the eastern Baltic Sea was investigated using samples from three sites in the Väinameri Sea. Using the otolith thin sections for the first time on ide otoliths, a new maximum age of 29 years was observed. It is suggested that otolith thin sections should be preferred to scales if clear-cut and accurate age determinations of ide are desired. The results demonstrated that ide population in the Baltic Sea may consist of individuals with more variable age range than previously reported. There was a significant difference in adult age structure among study sites (spawning stocks), which was also reflected in the overall abundance of ide in the particular site. Higher growth rates were recorded compared to historical datasets collected from the same region. A strong positive relationship between age and otolith weight was observed. Potential factors behind the differences in age structure and abundance among study sites are discussed.

1. Introduction

Ide, *Leuciscus idus*, is a large-bodied cyprinid that lives naturally in Europe and Asia. Generally ide is considered a freshwater species that inhabits large lowland rivers and nutrient-rich lakes (Kuliskova et al., 2009; Winter and Fredrich, 2003). However, in the brackish Baltic Sea where salinities are mostly below 10 psu, ide spawns in freshwater but otherwise lives in the sea, therefore displaying anadromous behavior (Müller and Berg, 1982). The sea offers more favorable feeding and living conditions, resulting in higher growth rate and body size compared to freshwaters (Järvalt et al., 2003). This allows to maximize fitness in terms of higher fecundity (McDowall, 1988; Müller and Berg, 1982). High growth rate in the sea makes ide an attractive target for small-scale commercial and especially recreational fisheries, although the overall landings are currently low. In Estonia ide is relatively abundant only around Hiiumaa Island; the historically important mainland (Matsalu and Saunja Bay) and Saaremaa Island (Nasva River) spawning stocks are in the lows (Järvalt et al., 2003; Eschbaum et al., 2014).

Age data is vital when estimations on growth rate, mortality rate and productivity are desired. The only peer-reviewed study on ide age used scales and was conducted with female fish that originated from a Polish freshwater lake (Targońska et al., 2012). Unfortunately, the growth rate was not in the scope of their study as only pre-spawn total weights of fish were provided. However, few scale-based studies on age and growth rate of Baltic Sea ide are published as grey literature (Cala, 1975; Järvalt et al., 2003). According to Fishbase (accessed in January of 2015) the maximum recorded age of ide is 18 years. However, a 28-year old specimen was reportedly caught near Vaasa, Finland (Segerstråle, 1950). Although Segerstråle does not specify the methods used in age determination process, it can be assumed that scales were used as this was the common practice at that time. A more recent publication from Finland states that the maximum reported age of ide in Finland is 23–24 years based on scale readings (Raitaniemi et al., 2000).

Otoliths are generally preferred to scales in aging a fish because they grow continuously and are metabolically inert (Campana and Thorrold, 2001). Scales are usually harder to read and they may also contain incomplete growth history due to loss of scales, leading to under- or overestimation of age (Campana, 2001; Howland et al., 2004; Raitaniemi et al., 2000). In cyprinids, the largest otolith is lapillus and it is therefore preferred over sagitta, which is usually used in aging a fish. As cyprinid lapillus is oddly shaped, thin section should be the best option to choose when accurate age estimates are desired (Raitaniemi et al., 2000). However, otoliths have the disadvantage that they require sacrificing the fish, which may be a serious problem when dealing with endangered species or

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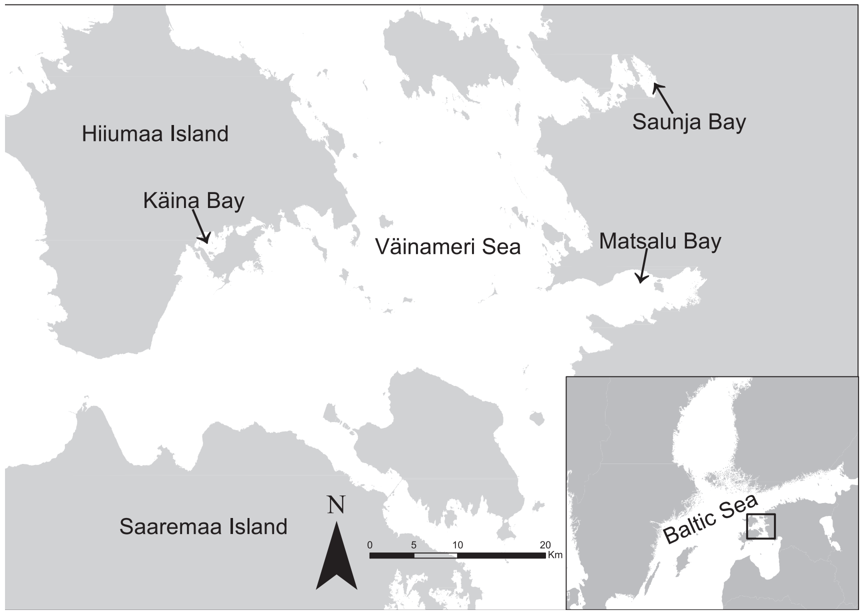

Fig. 1. Ide sampling sites from the Väinameri Sea, Baltic Sea (indicated with arrows).

population. Therefore, non-lethal collection of scales, and especially fin rays may be the best options in some cases (Howland et al., 2004; Zymonas and McMahon, 2009).

The aim of this study was to investigate the age structure of ide population sampled from three sites in western Estonia, Baltic Sea. Length at age estimates obtained in this study using otolith this sections were compared to similar scale-based data from the past. Also, the relationships between age, otolith weight and total length were investigated.

2. Materials and methods

2.1. Sample collection

A total of 141 ide were collected from three sites around Väinameri Sea (Fig. 1, Table 1). Käina Bay (KB) adult sample was obtained with gillnets as a part of another project in 2010, so extra sampling was not necessary. Matsalu Bay (MB) samples were purchased from a local fisherman in 2010–2013. Saunja Bay (SB) samples were collected in 2012–2013 with gillnets. A limited sample size was used in MB and SB because the numbers of ide are low at those sites (Eschbaum et al., 2014). All the sampled individuals were post-spawners or juveniles. For most of the individuals, total length (TL, 1 mm), total weight (TW, 0.1 g) and sex were recorded and otoliths (lapillus) removed immediately after capture. Some individuals were frozen by the fisherman and later thawed for analysis. Otoliths were cleaned and stored dry in micro-tubes.

2.2. Otolith preparation

Before processing, both otoliths were weighted to the nearest 0.1 mg. There were no differences between the weight of left and right otolith (paired *t*-test, $P = 0.1$); therefore, one otolith was chosen randomly for further preparation. As the cyprinid lapillus is oddly shaped and thick, it cannot be viewed directly for age determination. Raitaniemi et al. (2000) used otolith thin sections to age cyprinids like bream (*Abramis brama*) and white bream (*Blicca bjoerkna*). This method was also tested on ide in the present study and it turned out that frontal thin section is the best way to section ide otoliths. Therefore, otoliths were embedded into epoxy resin and subsequently a frontal thin section was obtained by grinding both sides of the block with silicon carbide sandpapers until the core was visible from one side. To improve the clarity of the thin sections, they were stained for 15 min in a solution of neutral red (1%) and acetic acid (0.5%) in distilled water. This resulted in clear-cut thin sections for most of the otoliths (Fig. 2).

2.3. Age and growth

Ages were determined by one experienced reader by counting the narrow winter zones on stained otoliths. This was done twice without any reference to fish TL and catch date. To estimate the precision of these readings, index of average percent error was calculated (IAPE) (Beamish and Fournier, 1981):

$$\text{IAPE} = 100\sum_{j=1}^{N_A}\left(R^{-1}\sum_{i=1}^{R}\left|X_{ij}-X_j\right|X_j^{-1}\right)N_A^{-1},$$

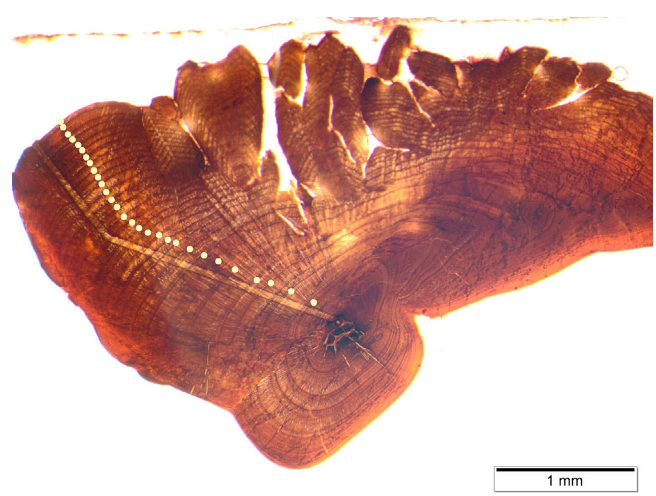

Fig. 2. Neutral red stained otolith thin section of a 29 year old ide caught from Saunja Bay. The light line on the otolith is the resultant crater from microchemical analysis (M.Rohtla, unpublished data). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)