NOBLE CRAYFISH _ASTACUS ASTACUS_ IN RIVERS OF WESTERN ESTONIA ISLANDS: DO LOW FLOW PERIOD INFLUENCES THE STOCK OF CRAYFISH?

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1. Introduction

Noble crayfish _Astacus astacus_ (L.) is an indigenous crayfish species in Estonia (Paaver & Hurt, 2009). Only licenced recreation catch is allowed now. In most monitored sites, population is weak except on island Saaremaa. Many factors have been considered affecting crayfish stock in Estonia waterbodies. Crayfish is endangered by diseases (especially plague), habitat deterioration (pollution, melioration, eutrophication, beaver’s dams), illegal fishing, alien species and predators (mink and otter). In many cases it is unknown why the stock is low or crayfish has disappeared. Drying up of smaller rivers during low flow periods is not an exceptional occasion in Estonia. Low flow as a factor of decrease of crayfish abundance, has not been observed until 2002 when decline of crayfish stock was linked to the extreme low flow event of 2002. The 2002 drought in Estonia was considered the most severe since 1961 and brought about restrictions for fishing crayfish during the following years to guarantee recovery of the stock in rivers.

The aim of the study was to find out if there is a relationship between the low flow indice (AM (30)) and crayfish stock (CPUE) in two rivers on islands Saaremaa and Hiiumaa.

2. Study area

The river Kuke (F=96 km²) on island Saaremaa and the river Luguse on island Hiiumaa (F=134 km²) (see Fig. 1) drain mainly natural catchment (forest and semi-natural areas and wetland) with an underlining geology of permeable Silurian and Ordovician limestone and dolomite.

3. Material and methods

Recorded hydrological data is not available for Kuke river. Alternatively, nearby river Lõve from similar hydrogeological area with long and continuous hydrological time series (1934-2013), were used as an analogue. The river Luguse has 43 y time-series (1970-2013). Flow duration curves (FDC) were derived from daily mean flow data. Annual minima 30 days series (AM(30)) used as low flow indice and fitted to Weibull distribution in frequency analysis. The annual lowest flows are found in summer months (June-July-August) for both rivers.

Standardized test fishing data collected by EMU in the period 1994–2013 were available. Fishing was carried out according to the standard Swedish protocol (Edsman & Söderbäck, 1999). Cylindrical traps with two conical entrances and 15 mm mesh size (knob to knob) were used. The abundance of crayfish was estimated as relative fishing efficiency (catch per unit effort, CPUE) i.e. number of crayfish caught per trap per night.

4. Results and discussion

FDC of both rivers have a steep gradient reflecting a high variability of daily flows (Fig.2): there is a distinct low flow period in both rivers. The curves of studied rivers have different shapes only for low flow period. Dry period is more pronounced for the river Luguse.

Frequency analysis of hydrological time-series revealed that at an average, the low flow (AM(30)) of 2002 in Kuke (0.12 m³/s), occurs once in a 4 year period. During test fishing period, the 0.12 m³/s or less have occurred in summers of 1997-1999 and 2003.

In the river Luguse, the AM(30) of 2002 (0.008 m³/s) occurs once in 7 year period. During test fishing period, the 0.008 m³/s or less event occurred in summers of 1996-1997, 2003 and 2006. Therefore, these low flow values are not unusual and drought could not be the only factor causing decline in crayfish stock in summer 2002.

Linear regression analysis results for both rivers showed no significant relationship between summer AM(30) and CPUE (the river Kuke: r=0.1, P=0.8; the river Luguse r=0.43, P=0.1).

5. Conclusion

There is no causal relationship found between low flow indice (AM (30)) and crayfish CPUE in two rivers of Western Estonia islands. Probably low flow alone as a factor does not influence crayfish stock in studied rivers. It would be worth to study relationship of the combined effect of low flow and some other factors again when the standardizised test fishing data series are longer.

References
