

Preface; Introduction to Pike and This Book

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The pike (*Esox lucius* Linnaeus, 1758), or northern pike as it is called in most of North America, is an iconic fish species that has fascinated mankind throughout history. Its large size and characteristic appearance have likely contributed to various tall stories, some of which are beautifully saved in Izaak Walton's "The Compleat Angler or the Contemplative man's Recreation" from 1653 (see e.g. Walton and Cotton 2005). The pike is there described as the tyrant of freshwaters, attacking everything from venomous frogs to birds to mules and people. There is also reference to anecdotes of pike being spontaneously generated from weed and glutinous matter with help of sunlight, and of specimens over 200 years old. Although such historical texts probably contain various degrees of misconception, they simultaneously nicely describe many aspects of pike as a fish species and fisheries target, and, perhaps most importantly, indicate how significant pike as a species has been and continues to be. Along similar lines, the pike has undoubtedly interested us for many years, from both personal and academic points of view, and it is with the abovementioned importance, significance and fascination in mind we have set the current book.

The last century shows an increasing and continuing interest in pike in the scientific literature (Fig. 1.1), warranting our summary of pike knowledge. Needless to say, it is impossible to cover all of those publications and knowledge

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on pike in a single book. Also, the scientific interest in and knowledge of pike have previously been reviewed in synopses, books and journal special issues, such as Raat (1988), Craig (1996), Pierce (2012) and Farrell et al. (2008). Although these volumes remain substantially influential to the pike literature and knowledge, they leave temporal and geographical knowledge gaps to the understanding of pike. To complement and extend from these volumes, as well as to update the current state of pike research and knowledge, the current contribution focuses on pike from three main angles in three sections; pike individual ecology, pike populations and their communities, as well as management and fisheries of pike.

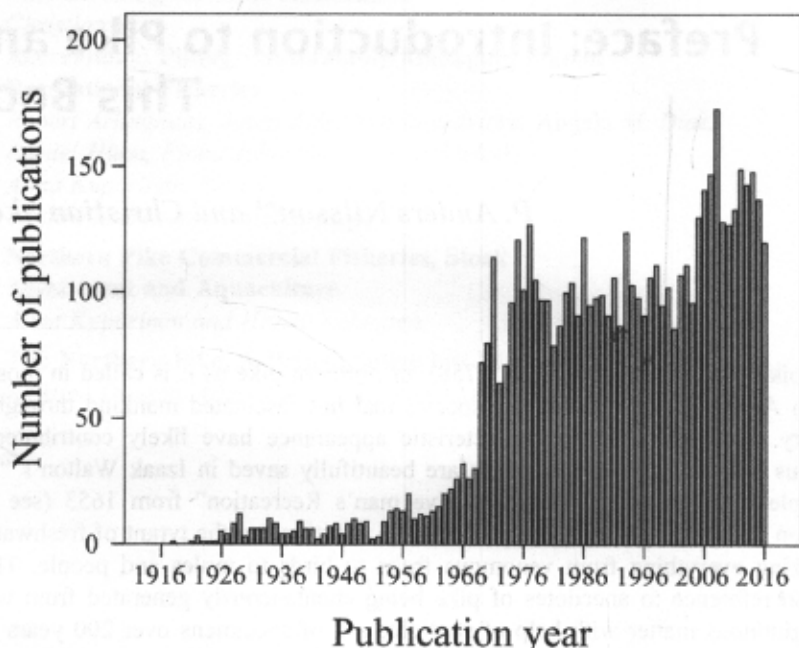


FIGURE 1.1 The annual (1916–2016) number of scientific publications including the search term “*Esox lucius*”, extracted from The Web of Science.

Adaptive decisions are made by individuals, and as such decisions can affect, for example, pike individual success, growth and survival, they have bearing also for pike population densities and size structures, as well as for trophic processes and management strategies. This volume therefore starts with a section on pike *Individuals*, with chapters focusing on pike foraging behaviour and decisions, how pike cope with different environments, the bioenergetics and growth of pike, and pike spatial ecology. In chapter 2, pike foraging behaviour is described and scrutinized from a predation-cycle perspective, highlighting effects of pike and prey interactions, as well as pike risks of predation, kleptoparasitism and cannibalism, on pike foraging performance, prey preference, and functional responses. Pike individual success moreover depends on the environment they live in, and chapter 3 deals with crucial aspects of vegetation, water clarity, temperature, oxygen, salinity, and pH for different pike life stages, all with possible climate change in mind.

The consequences of foraging and environment should be translated into growth and reproduction to contribute to lifetime fitness, and pike bioenergetics, growth and physiological capacities are considered in chapter 4, in light of pike energy budgets, emphasising the special adaptations pike possess. The last chapter of the *Individuals* section of the book deals with the spatial ecology of pike, and reviews e.g. migration, dispersal and home-range aspects for pike in various habitats based on data from mainly telemetry studies, describing important behavioural aspects of pike adaptive spatial behaviour. The above aspects of pike individual ecology are directly linked to pike individual success, population growth and composition, as well as community dynamics, and can add mechanistic understanding to such higher-order processes.

The second section of the book deals with pike *Populations and the Communities* they are part of, as this organizational level is of utmost interest for e.g. conservation and biodiversity incentives. Here, attention is paid to pike population size and structure, pike population genetics, and the possible trophic effects from pike predation. Chapter 6, on pike population size and structure, provides insight into density-dependent and -independent factors affecting recruitment and survival in pike populations, and thereby crucial aspects on e.g. ecological bottlenecks for pike population density and composition. Pike population genetics is a topic of utmost importance for understanding e.g. evolutionary history and population distributions, and is also central for conservation, management and stocking incentives, and chapter 7 thoroughly informs about the possibilities and limitations to using population genetics for such purposes. The third and last chapter of the *Populations and Communities* section, chapter 8, focuses on consequences of pike on consumer-resource and trophic dynamics and interactions, and frames pike predation effects in both general and system-specific ecological terminology and concept, elaborating on the theoretical and empirical direct and indirect consequences of pike intra- and interspecific interactions on predation rates and trophic cascades and system responses.

The third book section is on important aspects of pike *Management and Fisheries*, with chapters on stocking for population enhancement, habitat restoration, stocking for lake restoration, recreational pike fisheries, commercial fisheries and aquaculture, as well as pike as an invasive species. Management of fish populations commonly involves various methods for population enhancement, and chapter 9 starts off the third book section by introducing and evaluating stocking of pike as a means of enhancing pike populations. One crucial aspect affecting pike population density and composition is reproduction and recruitment, and chapter 10 specifically addresses spawning habitat restoration as a key to pike management. As pike are apex predators in many systems, pike predation conveys the potential for top-down trophic cascades with consequences for lake system composition, and chapter 11 reviews and analyses attempts at using pike stocking for biomanipulation and lake restoration incentives. The pike can moreover be viewed as a natural resource, perhaps particularly for recreational fisheries, and chapter 12 approaches the sustainable management of pike for recreational fisheries from both biological and human dimensions. Pike are also a natural resource for human consumption, and commercial fisheries, stock assessment and aquaculture, across geography and

history, are reviewed in chapter 13. In chapter 14, the final chapter of the book, the pike is viewed from a different angle; if pike are introduced to new systems, pike predation can have serious effects on prey species, trophic-interactions and system composition and function, and the disastrous nature of pike as an invasive species is therefore evaluated and highlighted.

As the book is an edited volume, different researchers have authored the different chapters according to individual expertise. Apart from the chapter topics, that were decided and requested by the editors, the chapter authors were given free hands to interpret and summarize the chapter contents. Moreover, the book contents were communicated during a symposium and workshop on pike biology and ecology at the Department of Biology - Aquatic ecology at Lund University, Sweden, 11-13 October 2016. This workshop was convened by the editors, and funded by the Hans Kristiansson Memory Foundation and Aquatic Ecology at Lund University, to allow the chapter authors to network and get inspired by each others' work, as well as to present their chapter contents during a well-attended symposium that was open to the public.

We are happy to have taken the opportunity to edit this book. Pike biology and ecology has always been intriguing to us, clearly indicated by numerous and sometimes intense discussions on aspects of pike during the last decades as colleagues and friends. Editing this book has, as most such editing processes often turn out, been a long and winding road that during periods seemed endless. We are therefore thrilled to express our gratitude to all the chapter authors who, more or less willingly, early on accepted to take charge of the different chapters. We are also grateful to all the chapter reviewers: Colin Adams, Robert Arlinghaus, John Armstrong, Søren Berg, Christer Brönmark, Julien Cucherousset, Kristine Dunker, Erik Eichbach, Olof Engstedt, Jonna Engström-Öst, Nicolas Guillerault, Thron Hagen, Lene Jacobsen, Martin Karlsson, Thomas Klefoth, Anna Kupařinen, Kai Lorentzen, Martyn Lucas, Petter Tibblin, Asbjørn Vøllestad and Klaus Wusyjack, who took their time to give constructive feedback to chapter authors. A special thank you goes to Kristine Dunker who kindly agreed to proofread and comment on the majority of the chapters. As we, Christian and Anders, have contributed equally to the production of this volume, the author order on the front of this book was decided by a roll of dice one fine Saturday evening in Grædstrup, Denmark.

One of our intentions with this volume is to highlight the importance of continuously summarizing and scrutinizing the knowledge on pike, to inspire ourselves, other researchers and further interest groups to update pike knowledge and to the greatest extent possible avoid future misconception on pike biology and ecology. Should we, for instance, view pike as ferocious, territorial, freshwater tyrants that always use a sit-and-wait, ambush tactic and consequently do not move? Should we, moreover, always view the pike as a cherished and desired fish species for recreational angling and commercial fisheries, that thereby deserves careful management and conservation, or may the pike be of great nuisance where it does not belong? The answers to some of these questions are given in this book while other answers are still not straightforward, why we strongly advocate continued formulation and testing of hypotheses on pike biology and ecology to further our understanding of this fascinating fish species on scientifically sound

analyses. The scientific interest in pike (Fig. 1.1) indicates a continuing and strong interest in pike, an interest likely partly driven by challenged and revised views of pike biology and ecology. This reasoning strongly implies a need for continued and recurring review of the knowledge on pike, and we hence indeed look forward to updated volumes by other editors some 15-25 years from now. Meanwhile, we hope this book can be an inspiration to anyone with an interest in the biology and ecology of pike (Fig. 1.2).



FIGURE 1.2 Pike *Esox lucius* Linnaeus, 1758 (Photos: Henrik Baktoft, Olof Engstedt and Søren Berg).

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