62 years of population dynamics of European perch (Perca fluviatilis) in a mesotrophic lake tracked using angler diaries: The role of commercial fishing, predation and temperature

Standardised angler diaries could produce useful proxy data for assessing fish population density and size distribution, but few rigorous studies about their utility exist. We use 62 years of angling diary data (1949–2010), from a large mesotrophic lake, to investigate population structure (abundance, mean size and record size) of European perch (Perca fluviatilis L.) in relation to the impact of three commercial fishers with different fishing strategies, pike (Esox lucius L.) predation and temperature. We found that anglers' harvest rates of perch varied by a factor of 10 over time, indicating large variation in population abundance over decadal time scales. Our statistical analysis revealed that the anglers’ harvest rates of perch were related to pike CPUE (proxy of pike predation), temperature and commercial fishing directly through the harvest of perch and indirectly through the harvest of pike, the top predator of the lake. The size distribution and growth rates of perch caught by anglers also changed substantially during the study period, most likely controlled by density-dependent mechanisms as well as size-selective commercial harvest. The effect of selective harvest on size-structure was stronger than ecological density dependence. We conclude that commercial harvesting may exert strong impacts on the quality of the angling experiences, at least in the studied case. Moreover, our work showcases the value of detailed angler diaries to study and monitor changes in freshwater fish populations, but it also underlines the need for supplementary data on biotic and abiotic factors to reach the full potential of angler diary data.
Angler apps as a source of recreational fisheries data: opportunities, challenges and proposed standards

Recreational fisheries surveys are limited in time and place in many countries. This lack of data limits scientific understanding and sustainable management. Smartphone applications (apps) allow anglers to record the details of their fishing trips and catches. In this study, we describe the opportunities and challenges associated with angler apps as a source of recreational fisheries data, and propose minimum standards for data collection via angler apps. Angler apps are a potentially valuable source of conventional and novel data that are both frequent and extensive, and an opportunity to engage anglers through data sharing and citizen science. Realizing this potential requires that we address significant challenges related to angler recruitment and retention, data quality and bias, and integration with existing fisheries programmes. We propose solutions to each of these challenges. Given that the angler app market is diverse, competitive and unpredictable, we emphasize minimum standards for data collection as a way to ensure large and reliable data sets that can be compared and integrated across apps. These standards relate to trips and catches, and angler demographics and behaviour, and should be supported through consultation and research. Angler apps have the potential to fundamentally change how anglers interact with the resource and with management.
A predation cost to bold fish in the wild

Studies of predator-mediated selection on behaviour are critical for our understanding of the evolution and maintenance of behavioural diversity in natural populations. Consistent individual differences in prey behaviour, especially in the propensity to take risks ("boldness"), are widespread in the animal kingdom. Theory predicts that individual behavioural types differ in a cost-benefit trade-off where bolder individuals benefit from greater access to resources while paying higher predation-risk costs. However, explicitly linking predation events to individual behaviour under natural conditions is challenging and there is currently little data from the wild. We assayed individual behaviour and electronically tagged hundreds of fish (roach, Rutilus rutilus) before releasing them into their lake of origin, thereby exposing them to predation risk from avian apex predators (cormorants, Phalacrocorax carbo). Scanning for regurgitated tags at the cormorant roosting site provided data on individual predation events. We found that fish with higher boldness have a greater susceptibility to cormorant predation compared to relatively shy, risk-averse individuals. Our findings hereby provide unique and direct evidence of behavioural type-dependent predation vulnerability in the wild, i.e. that there is a predation cost to boldness, which is critical for our understanding of the evolution and maintenance of behavioural diversity in natural populations.
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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
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Authors: Skov, C. (Intern)
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Fangstjournalen oktober 2017

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Organisations: National Institute of Aquatic Resources, Section for Monitoring and Data, Section for Freshwater Fisheries Ecology, Institute Management
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Pages: 34-35
Har du prøvet Fangstjournalen endnu?

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- **State:** Published
- **Organisations:** National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
- **Authors:** Skov, C. (Intern)
- **Publication date:** 2017
- **Main Research Area:** Technical/natural sciences
- **Links:**
  - [Havørred Fyn - fiskemagasin](https://issuu.com/seatrout.dk/docs/hav___rred_mag_2017_dk_isuu)
- **Publication:** Communication › Journal article – Annual report year: 2017

Hjælp din fisk og dine forskere med din telefon

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- **State:** Published
- **Organisations:** National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Institute Management
- **Authors:** Skov, C. (Intern), Reeh, L. (Intern)
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- **Links:**
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Hold styr på fredningsbælterne med Fangstjournalen

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Lakselus - Hjælp med at overvåge udbredelsen af lakselus

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  - [Havørred Fyn - fiskemagasin](https://issuu.com/seatrout.dk/docs/hav___rred_mag_2017_dk_isuu)
- **Publication:** Communication › Journal article – Annual report year: 2017
Pike (Esox lucius L.) on the edge: consistent individual movement patterns in transitional waters of the western Baltic

Pike in the western Baltic Sea live on the edge of their salinity tolerance. Under physiologically challenging conditions, organism may respond by moving to environmentally more benign areas during critical periods, such as during spawning. We hypothesised that pike in a brackish lagoon (8–10 ppt salinity) would perform spawning- and feeding-related movements between areas with different salinity regimes. Twenty-two pike were caught prior to spawning, tagged with acoustic transmitters, and their movements were tracked for 18 months. Pike showed two main patterns of movements that were consistent within individuals across two years. Whereas some individuals stayed in the lagoon year-round, most pike left the lagoon for longer periods after spawning and returned to the lagoon prior to following year’s spawning season. We found no evidence that probability of moving out of the lagoon co-varied with either length or condition factor. Despite the fact that the lagoon’s salinity is close to the reported upper limit for pike egg development, results indicated that all pike spawned in the lagoon. Correspondingly, genetic data showed that all fish belonged to the same reproductive population unit. Movement patterns thus appear to reflect individual variation in home-range and/or resource optimisation following ideal free principles.
Recreational sea fishing in Europe in a global context—Participation rates, fishing effort, expenditure, and implications for monitoring and assessment

Marine recreational fishing (MRF) is a high-participation activity with large economic value and social benefits globally, and it impacts on some fish stocks. Although reporting MRF catches is a European Union legislative requirement, estimates are only available for some countries. Here, data on numbers of fishers, participation rates, days fished, expenditures, and catches of two widely targeted species were synthesized to provide European estimates of MRF and placed in the global context. Uncertainty assessment was not possible due to incomplete knowledge of error distributions; instead, a semi-quantitative bias assessment was made. There were an estimated 8.7 million European recreational sea fishers corresponding to a participation rate of 1.6%. An estimated 77.6 million days were fished, and expenditure was €5.9 billion annually. There were higher participation, numbers of fishers, days fished and expenditure in the Atlantic than the Mediterranean, but the Mediterranean estimates were generally less robust. Comparisons with other regions showed that European MRF participation rates and expenditure were in the mid-range, with higher participation in Oceania and the United States, higher expenditure in the United States, and lower participation and expenditure in South America and Africa. For both northern European sea bass (Dicentrarchus labrax, Moronidae) and western Baltic cod (Gadus morhua, Gadidae) stocks, MRF represented 27% of the total removals. This study highlights the importance of MRF and the need for bespoke, regular and statistically sound data collection to underpin European fisheries management. Solutions are proposed for future MRF data collection in Europe and other regions to support sustainable fisheries management.

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Authors: Hyder, K. (Ekstern), Weltersbach, M. S. (Ekstern), Armstrong, M. (Ekstern), Ferter, K. (Ekstern), Townhill, B. (Ekstern), Ahvonen, A. (Ekstern), Arlinghaus, R. (Ekstern), Baikov, A. (Ekstern), Bellanger, M. (Ekstern), Birzaks, J. (Ekstern), Borch, T. (Ekstern), Cambie, G. (Ekstern), deGraaf, M. (Ekstern), Diogo, H. M. C. (Ekstern), Dziemian, Ł. (Ekstern), Gordoa, A. (Ekstern), Grzebielec, R. (Ekstern), Hartill, B. (Ekstern), Kagervall, A. (Ekstern), Kapiris, K. (Ekstern), Karlsson, M. (Ekstern), Kleiven, A. R. (Ekstern), Lejk, A. M. (Ekstern), Level, H. (Ekstern), Lovell, S. (Ekstern), Lyle, J.
Species integrity enhanced by a predation cost to hybrids in the wild

Species integrity can be challenged, and even eroded, if closely related species can hybridize and produce fertile offspring of comparable fitness to that of parental species. The maintenance of newly diverged or closely related species therefore hinges on the establishment and effectiveness of pre- and/or post-zygotic reproductive barriers. Ecological selection, including predation, is often presumed to contribute to reduced hybrid fitness, but field evidence for a predation cost to hybridization remains elusive. Here we provide proof-of-concept for predation on hybrids being a postzygotic barrier to gene flow in the wild. Cyprinid fishes commonly produce fertile, viable hybrid offspring and therefore make excellent study organisms to investigate ecological costs to hybrids. We electronically tagged two freshwater cyprinid fish species (roach Rutilus rutilus and bream Abramis brama) and their hybrids in 2005. Tagged fish were returned to their lake of origin, exposing them to natural predation risk from apex avian predators (great cormorant, Phalacrocorax carbo). Scanning for regurgitated tags under cormorant roosts 3-4 years later identified cormorant-killed individual fish and allowed us to directly test for a predation cost to hybrids in the wild. Hybrid individuals were found significantly more susceptible to cormorant predation than individuals from either parental species. Such ecological selection against hybrids contributes to species integrity, and can enhance species diversification.
Towards a mechanistic understanding of vulnerability to hook-and-line fishing: Boldness as the basic target of angling-induced selection

In passively operated fishing gear, boldness-related behaviors should fundamentally affect the vulnerability of individual fish and thus be under fisheries selection. To test this hypothesis, we used juvenile common-garden reared carp (Cyprinus carpio) within a narrow size range to investigate the mechanistic basis of behavioral selection caused by angling. We focused on one key personality trait (i.e., boldness), measured in groups within ponds, two morphological traits (body shape and head shape), and one life-history trait (juvenile growth capacity) and studied mean standardized selection gradients caused by angling. Carp behavior was highly repeatable within ponds. In the short term, over seven days of fishing, total length, not boldness, was the main predictor of angling vulnerability. However, after 20 days of fishing, boldness turned out to be the main trait under selection, followed by juvenile growth rate, while morphological traits were only weakly related to angling vulnerability. In addition, we found juvenile growth rate to be moderately correlated with boldness. Hence, direct selection on boldness will also induce indirect selection on juvenile growth and vice versa, but given that the two traits are not perfectly correlated, independent evolution of both traits is also possible. Our study is among the first to mechanistically reveal that energy-acquisition-related behaviors, and not growth rate per se, are key factors determining the probability of capture, and hence, behavioral traits appear to be the prime targets of angling selection. We predict an evolutionary response toward
increased shyness in intensively angling-exploited fish stocks, possibly causing the emergence of a timidity syndrome
Fangstjournalen: - Hold styr på dine fisketure og hjælp fiskebestandene

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General information
Phenotypic variation in metabolism and morphology correlating with animal swimming activity in the wild: relevance for the OCLTT (oxygen- and capacity-limitation of thermal tolerance), allocation and performance models

Ongoing climate change is affecting animal physiology in many parts of the world. Using metabolism, the oxygen- and capacity-limitation of thermal tolerance (OCLTT) hypothesis provides a tool to predict the responses of ectothermic animals to variation in temperature, oxygen availability and pH in the aquatic environment. The hypothesis remains controversial, however, and has been questioned in several studies. A positive relationship between aerobic metabolic scope and animal activity would be consistent with the OCLTT but has rarely been tested. Moreover, the performance model and the allocation model predict positive and negative relationships, respectively, between standard metabolic rate and activity. Finally, animal activity could be affected by individual morphology because of covariation with cost of transport. Therefore, we hypothesized that individual variation
in activity is correlated with variation in metabolism and morphology. To test this prediction, we captured 23 wild European perch (Perca fluviatilis) in a lake, tagged them with telemetry transmitters, measured standard and maximal metabolic rates, aerobic metabolic scope and fineness ratio and returned the fish to the lake to quantify individual in situ activity levels. Metabolic rates were measured using intermittent flow respirometry, whereas the activity assay involved high-resolution telemetry providing positions every 30 s over 12 days. We found no correlation between individual metabolic traits and activity, whereas individual fineness ratio correlated with activity. Independent of body length, and consistent with physics theory, slender fish maintained faster mean and maximal swimming speeds, but this variation did not result in a larger area (in square metres) explored per 24 h. Testing assumptions and predictions of recent conceptual models, our study indicates that individual metabolism is not a strong determinant of animal activity, in contrast to individual morphology, which is correlated with in situ activity patterns.

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Scopus rating (2014): SJR 0.109 SNIP 0
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Skånsomt fiskeri og genudsætning

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Authors: Skov, C. (Intern), Sivebæk, F. (Intern)
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Behavioural strategy of large perch Perca fluviatilis varies between a mesotrophic and a hypereutrophic lake

Behaviour of large perch Perca fluviatilis was studied in two lakes differing in environmental state i.e. mesotrophic v. hypereutrophic. A total of 20 adult perch P. fluviatilis (29–42 cm total length) in each lake were tagged with radio-transmitters, tracked and located eight times a day during six 24 h tracking periods over a year, enabling detection of differences in diel activity patterns and habitat use during summer and winter under two different environmental regimes. During summer, P. fluviatilis in the mesotrophic lake showed a distinct crepuscular activity pattern and a change from pelagic residency during daytime towards the littoral zone at night. In contrast, P. fluviatilis in the hypereutrophic lake were active during the entire diel cycle and were spread throughout the lake also during dark. During winter, crepuscular patterns of activity were seen in both lakes. Condition factor of large P. fluviatilis did not differ between the two lakes. Thus, it is suggested that P. fluviatilis in the hypereutrophic turbid lake adopted an alternative behaviour for successful foraging, being uniformly active throughout the diel cycle.

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Scopus rating (2015): SJR 0.951 SNIP 0.935 CiteScore 1.64
Web of Science (2015): Indexed yes
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Web of Science (2014): Indexed yes
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Scopus rating (2012): SJR 0.93 SNIP 1.035 CiteScore 1.88
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Scopus rating (2011): SJR 0.895 SNIP 0.946 CiteScore 1.66
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.774 SNIP 0.834
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.773 SNIP 0.891
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Effects of hatchery rearing practices and cortisol manipulation on growth, survival and seaward migration success of stocked and wild Atlantic salmon and brown trout smolts

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Authors: Aarestrup, K. (Intern), Skov, C. (Intern), Höglund, E. (Ekstern)
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Escaping peril: perceived predation risk affects migratory propensity
Although migratory plasticity is increasingly documented, the ecological drivers of plasticity are not well understood. Predation risk can influence migratory dynamics, but whether seasonal migrants can adjust their migratory behaviour according to perceived risk is unknown. We used electronic tags to record the migration of individual roach (Rutilus rutilus), a partially migratory fish, in the wild following exposure to manipulation of direct (predator presence/absence) and indirect (high/low roach density) perceived predation risk in experimental mesocosms. Following exposure, we released fish in their lake summer habitat and monitored individual migration to connected streams over an entire season. Individuals exposed to increased perceived direct predation risk (i.e. a live predator) showed a higher migratory propensity but no change in migratory timing, while indirect risk (i.e. roach density) affected timing but not propensity showing that elevated risk carried over to alter migratory behaviour in the wild. Our key finding demonstrates predator-driven migratory plasticity, highlighting the powerful role of predation risk for migratory decision-making and dynamics.

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animal migration, environmentally induced, facultative migration, mortality risk, predation

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Fischereilicher Besatzerfolg in Abhängigkeit von natürlicher Rekrutierung, Satzfischgröße und Besatzmenge

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From regionally predictable to locally complex population structure in a freshwater top predator: River systems are not always the unit of connectivity in Northern Pike Esox lucius

Contemporary genetic diversity is the product of both historical and contemporary forces, such as climatic and geological processes affecting range distribution and continuously moulded by evolutionary forces selection, gene flow and genetic drift. Predatory freshwater fishes, such as Northern Pike Esox lucius, commonly exhibit small population sizes, and several local populations are considered endangered. Pike inhabit diverse habitat types, including lakes, rivers and brackish marine waters, thus spanning from small isolated patches to large open marine systems. However, pike population structure from local to regional scales is relatively poorly described, in spite of its significance to developing conservation measures. We analysed microsatellite variation in a total of 1185 North European pike from 46 samples collected across both local and regional scales, as well as over time, to address two overarching questions: Is pike population structure associated with local and/or regional connectivity patterns, and which factors likely have the main influence on the contemporary distribution of genetic diversity? To answer this, we combined estimators of population diversity and structure to assess evidence of whether populations within (i) habitats, (ii) drainage systems and (iii) geographical regions are closer related than among these ranges, and whether patterns are temporally stable. Contrasting previous predictions that genetic drift obscures signals of postglacial colonisation history, we identified clear regional differences in population genetic signatures, suggesting a major effect of drainage divides on colonisation history and connectivity. However, several populations deviated from the general pattern, showing that local processes may be complex and need to be examined case-by-case

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Pages: 305-316
Performance assessment of two whole-lake acoustic positional telemetry systems - is reality mining of free-ranging aquatic animals technologically possible?

Acoustic positional telemetry systems (APTs) represent a novel approach to study the behaviour of free ranging aquatic animals in the wild at unprecedented detail. System manufactures promise remarkably high temporal and spatial resolution. However, the performance of APTs has rarely been rigorously tested at the level of entire ecosystems. Moreover, the effect of habitat structure on system performance has only been poorly documented. Two APTs were deployed to cover two small lakes and a series of standardized stationary tests were conducted to assess system performance. Furthermore, a number of tow tests were conducted to simulate moving fish. Based on these data, we quantified system performance in terms of data yield, accuracy and precision as a function of structural complexity in relation to vegetation. Mean data yield of the two systems was 40%(Lake1) and 60%(Lake2). Average system accuracy (acc) and precision (prec) were Lake1: acc = 3.1 m, prec = 1.1 m; Lake2: acc = 1.0 m, prec = 0.2 m. System performance was negatively affected by structural complexity, i.e., open water habitats yielded far better performance than structurally complex vegetated habitats. Post-processing greatly improved data quality, and sub-meter accuracy and precision were, on average, regularly achieved in Lake2 but remained the exception in the larger and structurally more complex Lake1. Moving transmitters were tracked well by both systems. Whereas overestimation of moved distance is inevitable for stationary transmitters due to accumulation of small tracking errors, moving transmitters can result in both over-and underestimation of distances depending on circumstances. Both deployed APTs were capable of providing high resolution positional data at the scale of entire lakes and are suitable systems to mine the reality of free ranging fish in their natural environment. This opens important opportunities to advance several fields of study such as movement ecology and animal social networks in the wild. It is recommended that thorough performance tests are conducted in any study utilizing APTs. The APTs tested here appear best suited for studies in structurally simple ecosystems or for studying pelagic species. In such situations, the data quality provided by the APTs is exceptionally high.

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Phenotypic variation in metabolism and morphology correlating with fish movements in the wild: a study combining respirometry and telemetry

General information
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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Institute Management, University of Porto
Shape up or ship out: Migratory behaviour predicts morphology across spatial scale in a freshwater fish

Migration is a widespread phenomenon, with powerful ecological and evolutionary consequences. Morphological adaptations to reduce the energetic costs associated with migratory transport are commonly documented for migratory species. However, few studies have investigated whether variation in body morphology can be explained by variation in migratory strategy within a species. We address this question in roach Rutilus rutilus, a partially migratory freshwater fish that migrates from lakes into streams during winter. We both compare body shape between populations that differ in migratory opportunity (open vs. closed lakes), and between individuals from a single population that vary in migratory propensity (migrants and residents from a partially migratory population). Following hydrodynamic theory, we posit that migrants should have a more shallow body depth, to reduce the costs associated with migrating into streams with higher flow conditions than the lakes the residents occupy all year round. We find evidence both across and within populations to support our prediction, with individuals from open lakes and migrants from the partially migratory population having a more slender, shallow-bodied morphology than fish from closed lakes and all-year residents. Our data suggest that a shallow body morphology is beneficial to migratory individuals and our study is one of the first to link migratory strategy and intraspecific variation in body shape.
What is the influence of a reduction of planktivorous and benthivorous fish on water quality in temperate eutrophic lakes? A systematic review

Background: In recent decades, many attempts have been made to restore eutrophic lakes through biomanipulation. Reducing the populations of planktivorous and benthivorous fish (either directly or through stocking of piscivorous fish) may induce ecosystem changes that increase water transparency and decrease the risk of algal blooms and fish kills, at least in the short term. However, the generality of biomanipulation effects on water quality across lake types and geographical regions is not known. Therefore, we have undertaken a systematic review of such effects in eutrophic lakes in temperate regions throughout the world. Methods: Searches for literature were made using online publication databases, search engines, specialist websites and bibliographies of literature reviews. Search terms were developed in English, Danish, Dutch and Swedish. Identified articles were screened for relevance using inclusion criteria set out in an a priori protocol. To reduce the risk of bias, we then critically appraised the combined evidence found on each biomanipulation. Data were extracted on outcomes such as Secchi depth and chlorophyll a concentration before, during and/or after manipulation, and on effect modifiers such as lake properties and amounts of fish removed or stocked. Results: Our searches identified more than 14,500 articles. After screening for relevance, 233 of them remained. After exclusions based on critical appraisal, our evidence base included useful data on 128 biomanipulations in 123 lakes. Of these interventions, 85% had been made in Europe and 15% in North America. Meta-analysis showed that removal of planktivores and benthivores (with or without piscivore stocking) leads to increased Secchi depth and decreased chlorophyll a concentration during intervention and the first three years afterwards. Piscivore stocking alone has no significant effect. The response of chlorophyll a levels to biomanipulation is stronger in lakes where fish removal is intense, and in lakes which are small and/or have high pre-manipulation concentrations of total phosphorus. Conclusions: Our review improves on previous reviews of biomanipulation in that we identified a large number of case studies from many parts of the world and used a consistent, repeatable process to screen them for relevance and susceptibility to bias. Our results indicate that removal of planktivorous and benthivorous fish is a useful means of improving water quality in eutrophic lakes. Biomanipulation tends to be particularly successful in relatively small lakes with short retention times and high phosphorus levels. More thorough fish removal increases the efficacy of biomanipulation. Nonetheless successes and failures have occurred across a wide range of conditions.

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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Swedish University of Agricultural Sciences, Norwegian University of Science and Technology, Linnaeus University, Royal Swedish Academy of Sciences, University of Wisconsin-Madison, Umeå University, Netherlands Institute of Ecology
Authors: Bernes, C. (Ekstern), Carpenter, S. R. (Ekstern), Gårdmark, A. (Ekstern), Larsson, P. (Ekstern), Persson, L. (Ekstern), Skov, C. (Intern), Speed, J. D. (Ekstern), Donk, E. V. (Ekstern)
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Publication information
Journal: Environmental Evidence
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Cormorant predation on PIT-tagged lake fish

The present study used data from recovered PIT (Passive Integrated Transponder) tags to explore species-and size-specific annual predation rates by cormorants on three common lacustrine fishes (size range 120-367 mm) in a European lake; roach (Rutilus rutilus), common bream (Abramis brama) and perch (Perca fluviatilis). In addition, we quantify the level of age/size truncation that cormorant predation could introduce in a population of perch, an important fish for recreational angling as well as for trophic interactions and ecosystem function in European lakes. Based on three years of PIT tagging of fish in Lake Viborg and subsequent recoveries of PIT tags from nearby cormorant roosting and breeding sites, we show that cormorants are major predators of roach, bream and perch within the size groups we investigated and for all species larger individuals had higher predation rates. Perch appear to be the most vulnerable of the three species and based on a comparison with mortality estimates from lakes without significant avian predation, this study suggests that predation from cormorants can induce age/size truncation in Lake Viborg, leaving very few larger perch in the lake. This truncation reduces the likelihood of anglers catching a large perch and may also influence lower trophic levels in the lake and thus turbidity as large piscivorous perch often play an important structuring role in lake ecosystem functioning.

Electronic versions:
Publishers version
Den lokaløkonomiske værdi af laksefiskeriet i Skjern Å

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DTU Aqua viser vejen til bedre fiskeri i søerne

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Effect of boat noise and angling on lake fish behaviour
The effects of disturbances from recreational activities on the swimming speed and habitat use of roach Rutilus rutilus, perch Perca fluviatilis and pike Esox lucius were explored. Disturbances were applied for 4h as (1) boating in short intervals with a small outboard internal combustion engine or (2) boating in short intervals combined with angling with artificial lures between engine runs. The response of the fish species was evaluated by high-resolution tracking using an automatic acoustic telemetry system and transmitters with sub-minute burst rates. Rutilus rutilus swimming speed was significantly higher during disturbances [both (1) and (2)] with an immediate reaction shortly after the engine started. Perca fluviatilis displayed increased swimming activity during the first hour of disturbance but not during the following hours. Swimming activity of E. lucius was not significantly different between disturbance periods and the same periods on days without disturbance (control). Rutilus rutilus increased their use of the central part of the lake during disturbances, whereas
no habitat change was observed in P. fluviatilis and E. lucius. No difference in fish response was detected between the two types of disturbances (boating with and without angling), indicating that boating was the primary source of disturbance. This study highlights species-specific responses to recreational boating and may have implications for management of human recreational activities in lakes.

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Authors: Jacobsen, L. (Intern), Baktoft, H. (Intern), Jepsen, N. (Intern), Aarestrup, K. (Intern), Berg, S. (Intern), Skov, C. (Intern)
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.57 SJR 0.741 SNIP 0.882
Web of Science (2016): Indexed yes
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Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.944 SNIP 0.934 CiteScore 1.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.049 SNIP 1.118 CiteScore 1.98
ISI indexed (2013): ISI indexed yes
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BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.895 SNIP 0.946 CiteScore 1.66
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Scopus rating (2010): SJR 0.774 SNIP 0.834
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.773 SNIP 0.891
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.883 SNIP 0.968
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.996 SNIP 1.06
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.897 SNIP 1.051
Fixed and flexible: coexistence of obligate and facultative migratory strategies in a freshwater fish

Migration is an important event in many animal life histories, but the degree to which individual animals participate in seasonal migrations often varies within populations. The powerful ecological and evolutionary consequences of such partial migration are now well documented, but the underlying mechanisms are still heavily debated. One potential mechanism of partial migration is between-individual variation in body condition, where animals in poor condition cannot pay the costs of migration and hence adopt a resident strategy. However, underlying intrinsic traits may overrule such environmental influence, dictating individual consistency in migratory patterns. Unfortunately, field tests of individual consistency compared to the importance of individual condition on migratory propensity are rare. Here we analyse 6 years of field data on roach migration, gathered by tagging almost 3000 individual fish and monitoring their seasonal migrations over extended periods of time. Our aims were to provide a field test of the role of condition in wild fish for migratory decisions, and also to assess individual consistency in migratory tendency. Our analyses reveal that (1) migratory strategy, in terms of migration/residency, is highly consistent within individuals over time and (2) there is a positive relationship between condition and the probability of migration, but only in individuals that adopt a migratory strategy at some point during their lives. However, life-long residents do not differ in condition to migrants, hence body condition is only a good predictor of migratory tendency in fish with migratory phenotypes and not a more general determinant of migratory tendency for the population. As resident individuals can achieve very high body condition and still remain resident, we suggest that our data provides some of the first field evidence to show that both facultative and obligate strategies can co-exist within populations of migratory animals

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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Lund University
Authors: Brodersen, J. (Ekstern), Chapman, B. B. (Ekstern), Nilsson, P. A. (Ekstern), Skov, C. (Intern), Hansson, L. (Ekstern), Brönmark, C. (Ekstern)
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Genudsætning og erhvervsfiskeristop: Vejen til et bedre geddefiskeri

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Authors: Skov, C. (Intern), Jansen, T. (Intern), Sivebæk, F. (Intern)
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Issue number: 8
ISSN (Print): 0108-2000
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ISI indexed (2012): ISI indexed no
Marine migrations in anadromous brown trout (Salmo trutta). Fjord residency as a possible alternative in the continuum of migration to the open sea

Partial migration is a common phenomenon in many fish species. Trout (Salmo trutta) is a partially migratory species where some part of the population migrate to the marine environment, while another remains in freshwater. In the years 2008 and 2009, a total of 159 wild sea trout smolts were tagged with acoustic and PIT-tags in the river Villestrup (Denmark) to study the initial postsmolt marine behaviour within a fjord system. We found that the strategies of the sea migrants vary: some stay in the fjord, while others migrate to the sea, suggesting that partial migration occurs even in the marine environments. Overall, a total of 53% of the tagged smolts migrated from the fjord to the sea, and 47% stayed (or potentially died) in the fjord. The ratios of fjord-resident versus seamigrating postsmolts were consistent at the study times, and no differences between the early and late migration periods of the smolts were observed. The individual's size or body condition at the time of tagging did not affect survival or the migratory decisions in the fjord. High overall initial survival (74%) was found 30 days after the fjord entry. We suggest that within a continuum of migration to sea, there is a migratory decision point when sea trout postsmolts encounter a fjord system. At this point, postsmolts will assess the possibility of migration versus the alternative of fjord residency.

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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Del Villar, D. (Intern), Aarestrup, K. (Intern), Skov, C. (Intern), Koed, A. (Intern)
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Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.66 SJR 0.804 SNIP 0.885
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.022 SNIP 1.192 CiteScore 1.92
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.866 SNIP 0.994 CiteScore 1.58
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.971 SNIP 1.072 CiteScore 1.77
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.061 SNIP 1.247 CiteScore 2.05
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.979 SNIP 0.887 CiteScore 1.65
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.812 SNIP 0.968
Natural recruitment, density-dependent juvenile survival, and the potential for additive effects of stock enhancement: an experimental evaluation of stocking northern pike (Esox lucius) fry

Density-dependent mortality in young life stages should strongly limit the potential for additive effects caused by stocking of fish sizes that are smaller than size at recruitment into the fishery. Indeed, stocking models have suggested that stocking of fry should not elevate year class strength in self-sustaining stocks. However, limited data based on replicated and controlled experiments are available to support this prediction. We performed a pond experiment (N = 4 per treatment) to compare the stock enhancing outcome of stocking hatchery-reared northern pike (Esox lucius) fry and the natural production of young in self-recruiting pike populations. We also added a treatment where pike fry were stocked into ponds that otherwise did not have pike to mimic the absence of natural recruitment. Fry stocking into self-reproducing stocks did not elevate year class strength over unstocked controls. However, in the absence of competition, year class strength of juveniles in late summer emerging from fry stocking was similar to the production of natural recruits. Overall, we demonstrated the competitive disadvantage of hatchery-reared fry when released into waters already containing natural recruits, the partial replacement of natural recruits by hatchery-reared fry, and the lack of additive effects of stock enhancement in naturally reproducing stocks. A stock-enhancing effect of pike fry stocking may only be expected in the absence of natural recruitment.
Nervøse skaller og kølige gedder – bådsejlads, fiskeri og fiskeadfærd

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Sejlads med bådmotor forstyrer fiskene – men der er forskel mellem arter

General information
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Authors: Jacobsen, L. (Intern), Baktoft, H. (Intern), Skov, C. (Intern)
Pages: 180-183
Publication date: 2014
Main Research Area: Technical/natural sciences

Sex identification and PIT-tagging: tools and prospects for studying intersexual differences in freshwater fishes
This study evaluated a technique to allow the long-term monitoring of individual fishes of known sex in the wild using sex confirmation in close proximity to the reproductive period combined with individual tagging. Hundreds of partially migratory roach Rutilus rutilus were tagged with passive integrated transponders (PIT) following sex determination in spring and various performance measures were compared with fish tagged outside the reproductive period in autumn. Short-term survival was >95% for R. rutilus sexed and tagged under natural field conditions. Total length (LT) did not affect the probability of survival within the size range tagged (119–280 m), nor were there differences in timing of migration the following season between individuals sexed and tagged in spring and individuals tagged in autumn (i.e. outside the reproductive period). Also, a similar per cent of R. rutilus sexed and tagged in spring and tagged in autumn migrated the following season (34.5 and 34.7%). Moreover, long-term recapture data revealed no significant differences in body condition between R. rutilus individuals sexed and tagged in spring, individuals tagged in autumn and unmanipulated individuals. The observed sex ratio of recaptured fish did not differ from the expected values of equal recapture rates between males and females. Hence, there is no observable evidence for an adverse effect of tagging close to the reproductive period and therefore this method is suitable for studying intersexual differences and other phenotypic traits temporarily expressed during reproduction at the individual level in fishes

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Skarven æder også de store fisk

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Skarvprædation på søfisk: Et indblik fra Viborg Søerne

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Original language: Danish
Publication: Communication › Journal article – Annual report year: 2014
The effect of turbidity and prey fish density on consumption rates of piscivorous Eurasian perch Perca fluviatilis

Predator-prey interaction strengths in variable environments constitute a fundamental link to the understanding of aquatic ecosystem responses to environmental change. The present study investigates the effects of visibility conditions and prey fish density on predation rates of visually oriented piscivorous Eurasian perch Perca fluviatilis L. This was done in outdoor mesocosm (16 m²) experiments with clear water and two levels of turbidity (25 and 105 NTU) and two prey fish densities [3.1 and 12.5 roach Rutilus rutilus (L.) individuals m⁻²]. Perch consumption rates were affected by visibility less than expected, while they were highly affected by increased prey fish density. Perch responded to high prey density in all visibility conditions, indicating that prey density is more crucial for consumption than visibility in turbid lakes.

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BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.574 SNIP 0.861 CiteScore 1.66
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.704 SNIP 0.833 CiteScore 1.62
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.437 SNIP 0.586 CiteScore 1.14
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.547 SNIP 0.934 CiteScore 1.4
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.718 SNIP 0.998 CiteScore 1.39
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.562 SNIP 0.728 CiteScore 1.29
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.411 SNIP 0.735
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.335 SNIP 0.592
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.401 SNIP 0.794
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.592 SNIP 0.617
Scopus rating (2006): SJR 0.845 SNIP 1.091
Scopus rating (2005): SJR 0.456 SNIP 0.814
Scopus rating (2004): SJR 0.283 SNIP 0.519
Scopus rating (2003): SJR 0.475 SNIP 1.072
Scopus rating (2002): SJR 0.649 SNIP 0.768
The physiological basis of the migration continuum in brown trout (Salmo trutta)

Partial migration is common in many animal taxa; however, the physiological variation underpinning migration strategies remains poorly understood. Among salmonid fishes, brown trout (Salmo trutta) is one of the species that exhibits the most complex variation in sympatric migration strategies, expressed as a migration continuum, ranging from residency to anadromy. In looking at brown trout, our objective with this study was to test the hypothesis that variation in migration strategies is underpinned by physiological variation. Prior to migration, physiological samples were taken from fish in the stream and then released at the capture site. Using telemetry, we subsequently classified fish as resident, short-distance migrants (potamodromous), or long-distance migrants (potentially anadromous). Our results revealed that fish belonging to the resident strategy differed from those exhibiting any of the two migratory strategies. Gill Na,K-ATPase activity, condition factor, and indicators of nutritional status suggested that trout from the two migratory strategies were smoltified and energetically depleted before leaving the stream, compared to those in the resident strategy. The trout belonging to the two migratory strategies were generally similar; however, lower triacylglycerides levels in the short-distance migrants indicated that they were more lipid depleted prior to migration compared with the long-distance migrants. In the context of migration cost, we suggest that additional lipid depletion makes migrants more inclined to terminate migration at the first given feeding opportunity, whereas individuals that are less lipid depleted will migrate farther. Collectively, our data suggest that the energetic state of individual fish provides a possible mechanism underpinning the migration continuum in brown trout.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Institute Management, Aarhus University, University of Southern Denmark, University of Porto
Authors: Boel, M. (Intern), Aarestrup, K. (Intern), Baktoft, H. (Intern), Larsen, T. (Intern), Madsen, S. S. (Ekstern), Malte, H. (Ekstern), Skov, C. (Intern), Svendsen, J. C. (Intern), Koed, A. (Intern)
Pages: 334-345
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Web of Science (2017): Indexed Yes
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Scopus rating (2016): SJR 0.885 SNIP 0.749 CiteScore 1.93
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.175 SNIP 0.893 CiteScore 2.16
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.246 SNIP 0.889 CiteScore 2.26
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 0.999 SNIP 0.785 CiteScore 2.08
ISI indexed (2013): ISI indexed yes
**Winter activity of roach and perch in a temperate lake by high resolution positioning telemetry**

**General information**

State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Institute Management
Authors: Jacobsen, L. (Intern), Baktoft, H. (Intern), Berg, S. (Intern), Jepsen, N. (Intern), Koed, A. (Intern), Aarestrup, K. (Intern), Skov, C. (Intern)
Publication date: 2014
Event: Abstract from EcoFiL, Ceske Budejovice, Czech Republic.
Main Research Area: Technical/natural sciences
Publication: Research › Conference abstract for conference – Annual report year: 2014

**A foraging cost of migration for a partially migratory cyprinid fish**

Migration has evolved as a strategy to maximise individual fitness in response to seasonally changing ecological and environmental conditions. However, migration can also incur costs, and quantifying these costs can provide important clues to the ultimate ecological forces that underpin migratory behaviour. A key emerging model to explain migration in many systems posits that migration is driven by seasonal changes to a predation/growth potential (p/g) trade-off that a wide range of animals face. In this study we assess a key assumption of this model for a common cyprinid partial migrant,
the roach Rutilus rutilus, which migrates from shallow lakes to streams during winter. By sampling fish from stream and lake habitats in the autumn and spring and measuring their stomach fullness and diet composition, we tested if migrating roach pay a cost of reduced foraging when migrating. Resident fish had fuller stomachs containing more high quality prey items than migrant fish. Hence, we document a feeding cost to migration in roach, which adds additional support for the validity of the p/g model of migration in freshwater systems.

**General information**
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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Aarhus University
Authors: Chapman, B. B. (Ekstern), Eriksen, A. (Intern), Baktoft, H. (Intern), Brodersen, J. (Ekstern), Nilsson, P. A. (Ekstern), Hulthen, K. (Ekstern), Brönmark, C. (Ekstern), Hansson, L. (Ekstern), Grønkjær, P. (Forskerdatabase), Skov, C. (Intern)
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Volume: 8
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.11 SJR 1.201 SNIP 1.092
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.414 SNIP 1.131 CiteScore 3.32
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.545 SNIP 1.141 CiteScore 3.54
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.74 SNIP 1.147 CiteScore 3.94
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.945 SNIP 1.142 CiteScore 4.15
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 2.369 SNIP 1.23 CiteScore 4.58
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 2.631 SNIP 1.161
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 2.473 SNIP 0.985
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 2.323 SNIP 0.96
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.289 SNIP 0.525
A lake as a microcosm: reflections on developments in aquatic ecology

In the present study, we aim at relating Forbes' remarkable paper on "The lake as a microcosm", published 125 years ago, to the present status of knowledge in our own research group. Hence, we relate the observations Forbes made to our own microcosm, Lake Krankesjön in southern Sweden, that has been intensively studied by several research groups for more than three decades. Specifically, we focus on the question: Have we made any significant progress or did Forbes and colleagues blaze the trail through the unknown wilderness and we are mainly paving that intellectual road? We conclude that lakes are more isolated than many other biomes, but have, indeed, many extensions, for example, input from the catchment, fishing and fish migration. We also conclude that irrespective of whether lakes should be viewed as microcosms or not, the paper by Forbes has been exceptionally influential and still is, especiably since it touches upon almost all aspects of the lake ecosystem, from individual behaviour to food web interactions and environmental issues. Therefore, there is no doubt that even if 125 years have passed, Forbes' paper still is a source of inspiration and deserves to be read. Hence, although aquatic ecology has made considerable progress over the latest century, Forbes might be viewed as one of the major pioneers and visionary scientists of limnology.
Effects of angling and manual handling on pike behaviour investigated by high-resolution positional telemetry

Human disturbances such as angling and manual handling may have long-term effects on the behaviour of pike, *Esox lucius* L., an ecologically important species. Using continuous high-resolution positional telemetry, this study compared the swimming activity of handled and unhandled pike in a small lake. Pike pre-equipped with acoustic transmitters were angled and exposed to a handling protocol including measurements of length and mass. Pike not recaptured constituted an unhandled control group. Results demonstrated that the handling protocol caused temperature-dependent changes in pike activity, with higher temperatures leading to lower activity of the recaptured pike. The effects, however, were transitory and not detectable after 48-h post-release. These findings indicate that pike are relatively resilient to handling and quickly resume pre-handling activity.
Effects of passive integrated transponder tags on survival and growth of juvenile Atlantic salmon Salmo salar

Background: A laboratory experiment was conducted to assess the potential impacts of surgically implanted 23 and 32 mm passive integrated transponder (PIT) tags on survival, growth, and body condition of juvenile Atlantic salmon Salmo salar. Rate of tag retention and healing of the tagging incision were also evaluated. Atlantic salmon of three different size classes (I: 80 to 99 mm fork length (FL), II: 100 to 119 mm FL, III: 120 to 135 mm FL) were allocated to each of five experimental treatment groups: control, sham-operated (surgery without PIT-tag implantation), 23 mm PIT-tag implantation with and without suture closure of the incision, and 32 mm PIT-tag implantation without suture closure.

Results: Over the 35-day experiment, mortality occurred only among fish tagged with 32 mm PIT tags (14%) and all fish larger than 103 mm FL survived. Non-sutured Atlantic salmon between 80 and 99 mm FL survived. Non-sutured Atlantic salmon between 80 and 99 mm FL implanted with 23 mm PIT tags had a significantly lower mean specific growth rate of mass compared with untagged (control and sham-operated) and sutured conspecifics. However, no significant difference in growth was found between untagged fish and 23 mm PIT-tagged fish 100 to 135 mm FL. Implantation of 32 mm PIT tags decreased growth in all size classes. Regardless of size class, body condition of the fish was not affected by PIT tagging. Retention rates of 23 mm PIT tags with and without...
suture closure were 100% and 97%, respectively; retention of 32 mm PIT tags without suture closure was 69%. At the end of the experiment, tagging incisions without suture closure were generally well-healed. Fungal infection and inflammation around the incision site occurred only when suture was used, in 46% of size class I, 21% of size class II and 38% of size class III.

Conclusions: Although suture closure of the incision following 23 mm PIT-tag implantation had a positive impact on growth of fish smaller than 100 mm FL, we advise against the use of sutures due to high rates of fungal infection around the incision site. Hence, results suggest that surgical implantation of 23 mm PIT tags without suture closure of the incision is a feasible method for marking juvenile Atlantic salmon 100 to 135 mm FL. Further, we caution researchers about the use of 32 mm PIT tags in juvenile Atlantic salmon 80 to 135 mm FL due to high rate of tag rejection and reduced survival and growth.
Fiskeri efter søfisk; regler, metoder og statistik

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern)
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Forbedre levesteder for fisk i søer

General information
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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern)
Publication date: 2013

Frivillig fredningstid

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern)
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Frivillig mindstemål

General information
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Authors: Skov, C. (Intern)
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Frivillig totalfredning

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Authors: Skov, C. (Intern)
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Publication: Communication › Internet publication – Annual report year: 2013

Geddens årsrytme

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern), Baktoft, H. (Intern), Jacobsen, L. (Intern)
Pages: 18-19
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Main Research Area: Technical/natural sciences

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Journal: Sportsfiskeren
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Genudsætning

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Authors: Skov, C. (Intern)
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Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/soeer/fiskepleje-i-din-s%c3%b8/fiskerireguleringer/Genuds%c3%a6tning.aspx
Publication: Communication › Internet publication – Annual report year: 2013

Gydeområder for fisk i søer

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Migration confers survival benefits against avian predators for partially migratory freshwater fish

The importance of predation risk in shaping patterns of animal migration is not well studied, mostly owing to difficulties in accurately quantifying predation risk for migratory versus resident individuals. Here, we present data from an extensive field study, which shows that migration in a freshwater fish (roach, Rutilus rutilus) that commonly migrates from lakes to streams during winter confers a significant survival benefit with respect to bird (cormorant, Phalacrocorax carbo spp.) predation. We tagged over 2000 individual fish in two Scandinavian lakes over 4 years and monitored migratory behaviour using passive telemetry. Next, we calculated the predation vulnerability of fish with differing migration strategies, by recovering data from passive integrated transponder tags of fish eaten by cormorants at communal roosts close to the lakes. We show that fish can reduce their predation risk from cormorants by migrating into streams, and that probability of being preyed upon by cormorants is positively related to the time individuals spend in the lake during winter. Our data add to the growing body of evidence that highlights the importance of predation for migratory dynamics, and, to our knowledge, is one of the first studies to directly quantify a predator avoidance benefit to migrants in the field.
Mindre fisketryk

General information
Reliability of non-lethal assessment methods of body composition and energetic status exemplified by applications to eel (Anguilla anguilla) and carp (Cyprinus carpio)

Non-lethal assessments of proximate body composition of fish can help unravelling the physiological and condition-dependent mechanisms of individual responses to ecological challenges. Common non-lethal methods designed to index nutrient composition in fish include the relative condition factor (Kn), bioelectric impedance-based assessments of body composition (BIA), and microwave-based “fat” meters (FM). Previous studies have revealed mixed findings as to the reliability of each of these. We compared the performance of Kn, BIA and FM at different temperatures to predict energetic status of the whole bodies of live eel (Anguilla anguilla) and carp (Cyprinus carpio) and the dorsal white muscle of carp. Homogenized fish flesh was used for calibration. Relative dry mass was strongly correlated with relative fat content (R^2 up to 96.7%) and energy density (R^2 up to 99.1%). Thus, calibrations were only conducted for related dry mass as an index of energetic status of a fish. FM readings were found to predict relative dry mass of whole body in eel (R^2 = 0.707) and carp (R^2 = 0.676), and dorsal white muscle of carp (R^2 = 0.814) well. By contrast, BIA measurements and Kn were much less suited to identify variation in relative dry mass. BIA-based models were also temperature-dependent. As a result, a regression model calibrated at 10°C and applied to BIA measurements at 20°C was found to underestimate energetic status of a fish. By contrast, no effects of temperature on FM calibration results were found. Based on our study, the FM approach is the most suitable method to non-lethally estimate energetic status in both, carp and eel, whereas BIA is of limited use for energetic measurements in the same species, in contrast to other reports in the literature.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Humboldt-Universität zu Berlin
Authors: Kiefoth, T. (Ekstern), Skov, C. (Intern), Aarestrup, K. (Intern), Arlinghaus, R. (Ekstern)
Pages: 18-26
Publication date: 2013
Main Research Area: Technical/natural sciences

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Journal: Fisheries Research
Volume: 146
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BFI (2018): BFI-level 1
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BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.21 SJR 1.12 SNIP 1.136
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.067 SNIP 1.133 CiteScore 2.01
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.105 SNIP 1.312 CiteScore 2.17
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.037 SNIP 1.173 CiteScore 1.85
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.177 CiteScore 1.78
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.154 SNIP 1.135 CiteScore 1.7
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.041 SNIP 1.1
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.985 SNIP 1.065
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.938 SNIP 1.142
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.022 SNIP 1.075
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.025 SNIP 1.274
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.906 SNIP 1.134
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.944 SNIP 1.023
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 1.076 SNIP 1.314
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.299 SNIP 1.22
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.934 SNIP 0.891
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.611 SNIP 0.836
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.546 SNIP 0.865
Original language: English
DOIs:
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Publication: Research - peer-review › Journal article – Annual report year: 2013
Sådan undersøger du fiskebestanden i en sø

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern)
Publication date: 2013

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Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/soeer/fiskepleje-i-din-s%c3%b8/saadan-undersoeger-du-fiskebestanden.aspx
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Skjulesteder for fisk i søer

General information
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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern)
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Main Research Area: Technical/natural sciences
Links:
http://www.fiskepleje.dk/soeer/fiskepleje-i-din-s%c3%b8/bedre-levesteder/skjulesteder-for-fisk.aspx
Publication: Communication › Internet publication – Annual report year: 2013

Søernes fisk

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State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Berg, S. (Intern), Skov, C. (Intern)
Pages: 339-365
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Place of publication: København
Publisher: Gyldendal
Editor: Jensen, K. S.
ISBN (Print): 978-87-02-030297
Chapter: 17
Main Research Area: Technical/natural sciences
Publication: Research - peer-review › Book chapter – Annual report year: 2013

There and back again: migration in freshwater fishes

Animal migration is an amazing phenomenon that has fascinated humans for long. Many freshwater fishes also show remarkable migrations, whereof the spectacular mass migrations of salmonids from the spawning streams are the most well known and well studied. However, recent studies have shown that migration occurs in a range of freshwater fish taxa from many different habitats. In this review we focus on the causes and consequences of migration in freshwater fishes. We start with an introduction of concepts and categories of migration, and then address the evolutionary causes that drive individuals to make these migratory journeys. The basis for the decision of an individual fish to migrate or stay resident is an evaluation of the costs and benefits of different strategies to maximize its lifetime reproductive effort. We provide examples by discussing our own work on the causes behind seasonal migration in a cyprinid fish, roach (Rutilus rutilus (L., 1758)), within this framework. We then highlight different adaptations that allow fish to migrate over sometimes vast journeys across space, including capacity for orientation, osmoregulation, and efficient energy expenditure. Following this we consider the consequences of migration in freshwater fish from ecological, evolutionary, and conservation perspectives, and finally, we detail some of the recent developments in the methodologies used to collect data on fish migration and how these could be used in future research.
Udfyld fangstjournal

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- **Organisations:** National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
- **Authors:** Skov, C. (Intern)
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- **Authors:** Sivebæk, F. (Intern), Skov, C. (Intern)
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- **Source/Publisher:** Fiskepleje.dk
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- **Links:**
  - [http://www.fiskepleje.dk/soeer/fiskepleje-i-din-s%c3%b8/udsaetning.aspx](http://www.fiskepleje.dk/soeer/fiskepleje-i-din-s%c3%b8/udsaetning.aspx)

Vandkvalitet i søer

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  - [http://www.fiskepleje.dk/soeer/fiskepleje-i-din-s%c3%b8/bedre-levesteder/vandkvalitet-i-soer.aspx](http://www.fiskepleje.dk/soeer/fiskepleje-i-din-s%c3%b8/bedre-levesteder/vandkvalitet-i-soer.aspx)

Vidensbanken

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- **Authors:** Skov, C. (Intern)
- **Publication date:** 2013

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- **Main Research Area:** Technical/natural sciences
- **Links:**
  - [http://www.fiskepleje.dk/Soeer/vidensbanken](http://www.fiskepleje.dk/Soeer/vidensbanken)
Voluntary angler logbooks reveal long-term changes in a lentic pike, Esox lucius, population

Sixty-two years of voluntarily collected angling logbook data from a large natural Danish lake were used to study variation in pike, Esox lucius L., CPUE (expressed as no. of captured per boat trip) as an index of stock size. Pike CPUE was positively related to pike release rate by anglers and negatively affected by certain commercial shers. The stocking of young-of-the-year pike and a shery-dependent index of perch, Perca fluviatilis L., abundance (which may be pike prey or predator depending on size) did not correlate with pike CPUE. Analyses of the size distribution of pike, based on sizes of annual record trophy pike captured by anglers, conrmed the negative impact of commercial pike shing and revealed a positive inuence of air temperature. It is concluded that high-quality angler logbooks that record effort and catch can be a cost-effective tool to inform lake fisheries management by revealing long-term population trends. Further, state space modelling, a statistical technique not yet seen in recreational fisheries science, is recommended as a tool to model proxies for population dynamics from angler logbook data

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Ocean Ecology and Climate, Section for Freshwater Fisheries Ecology
Authors: Jansen, T. (Intern), Arlinghaus, R. (Ekstern), Als, T. D. (Intern), Skov, C. (Intern)
Pages: 125-136
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Main Research Area: Technical/natural sciences

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Journal: Fisheries Management and Ecology
Volume: 20
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BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.85 SJR 0.843 SNIP 0.88
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.988 SNIP 1.159 CiteScore 1.91
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.913 SNIP 0.995 CiteScore 1.85
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.737 SNIP 0.807 CiteScore 1.36
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.636 SNIP 0.868 CiteScore 1.32
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.844 SNIP 0.932 CiteScore 1.29
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.847 SNIP 0.808
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.796 SNIP 0.936
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.823 SNIP 0.87
Web of Science (2008): Indexed yes
What is the influence on water quality in temperate eutrophic lakes of a reduction of planktivorous and benthivorous fish? A systematic review protocol

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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Royal Swedish Academy of Sciences, University of Wisconsin-Madison, Lund University, Umeå University, Netherlands Institute of Ecology, Linnaeus University
Authors: Bernes, C. (Ekstern), Carpenter, S. R. (Ekstern), Gårdmark, A. (Ekstern), Larsson, P. (Ekstern), Persson, L. (Ekstern), Skov, C. (Intern), Donk, E. V. (Ekstern)
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Scopus rating (2014): SNIP 0.9 SJR 0.851
Scopus rating (2013): SNIP 0.225 SJR 0.207
ISI indexed (2013): ISI indexed no
Scopus rating (2012): SJR 0.122 SNIP 0
Original language: English
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http://www.environmentalevidencejournal.org/content/2/1/9
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Aspects of lentic fish behaviour studied with high resolution positional telemetry

General information
Effect of anthropogenic disturbances on lake fish individual behaviour

Partial migration in fishes: causes and consequences

Effekten af rekreative aktiviteter på fiskenes adfærd i en lille sø

Partial migration in fishes: causes and consequences

Partial migration, where only some individuals from a population migrate, has been widely reported in a diverse range of animals. In this paper, what is known about the causes and consequences of partial migration in fishes is reviewed. Firstly, the ultimate and proximate drivers of partial migration are reflected upon: what ecological factors can shape the evolution of migratory dimorphism? How is partial migration maintained over evolutionary timescales? What proximate mechanisms determine whether an individual is migratory or remains resident? Following this, the consequences of partial migration are considered, in an ecological and evolutionary context, and also in an applied sense. Here it is argued that understanding the concept of partial migration is crucial for fisheries and ecosystem managers, and can provide information for conservation strategies. The review concludes with a reflection on the future opportunities in this field, and the avenues of research that are likely to be fruitful to shed light on the enduring puzzle of partial migration in fishes.
ISSN (Print): 0022-1112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.57 SJR 0.741 SNIP 0.882
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.951 SNIP 0.935 CiteScore 1.64
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.944 SNIP 0.934 CiteScore 1.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.049 SNIP 1.118 CiteScore 1.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.035 CiteScore 1.88
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.895 SNIP 0.946 CiteScore 1.66
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.774 SNIP 0.834
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.773 SNIP 0.891
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.883 SNIP 0.968
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.996 SNIP 1.06
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.897 SNIP 1.051
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.827 SNIP 0.898
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.945 SNIP 1.148
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.937 SNIP 1.096
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.949 SNIP 1.056
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.874 SNIP 1.1
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.751 SNIP 0.993
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.025 SNIP 1.176
Partial migration in fishes: definitions, methodologies and taxonomic distribution.

Partial migration, where populations are composed of both migratory and resident individuals, is extremely widespread across the animal kingdom. Researchers studying fish movements have long recognized that many fishes are partial migrants, however, no detailed taxonomic review has ever been published. In addition, previous work and synthesis has been hampered by a varied lexicon associated with this phenomenon in fishes. In this review, definitions and important concepts in partial migration research are discussed, and a classification system of the different forms of partial migration in fishes introduced. Next, a detailed taxonomic overview of partial migration in this group is considered. Finally, methodological approaches that ichthyologists can use to study this fascinating phenomenon are reviewed. Partial migration is more widespread amongst fishes than previously thought, and given the array of techniques available to fish biologists to study migratory variation the future of the field looks promising.

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology, Division of Food Chemistry, Center for Biological Sequence Analysis, Studieadministrationen
Authors: Chapman, B. B. (Ekstern), Skov, C. (Intern), Hulthén, K. (Ekstern), Brodersen, J. (Forskerdatabase), Nilsson, P. A. (Intern), Hansson, L. (Intern), Brönmark, C. (Ekstern)
Pages: 479-499
Publication date: 2012
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Fish Biology
Volume: 81
Issue number: 2
ISSN (Print): 0022-1112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.57 SJR 0.741 SNIP 0.882
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.951 SNIP 0.935 CiteScore 1.64
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.944 SNIP 0.934 CiteScore 1.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.049 SNIP 1.118 CiteScore 1.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.035 CiteScore 1.88
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.895 SNIP 0.946 CiteScore 1.66
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Seasonal and diel effects on the activity of northern pike studied by high-resolution positional telemetry

Temperate lakes can be ice covered for several months each year, yet little is known about the behaviour and activity of the fish during the cold season. As northern pike represents the top of the food web in many northern temperate lakes and may structure the ecosystem both directly and indirectly, a detailed understanding of the behaviour of this species during winter is important. We continuously monitored the activity of adult northern pike (Esox lucius) in a small temperate lake from late summer to winter for two consecutive years using an automatic acoustic positional telemetry system. Four subsample periods representing different temperature regimes from each year were chosen for further investigation. The results revealed that pike activity was similar between seasons. In all periods, a distinct diel pattern, showing increased activity during day as compared to night, was evident. Our findings indicate that the fish component of temperate lentic ecosystems can be more active during the cold season than previously assumed. This may have implications for the structuring effect of pike on the lower trophic levels.
Visibility conditions and diel period affect small-scale spatio-temporal behaviour of pike Esox lucius in the absence of prey and conspecifics

Pike Esox lucius in the absence of prey and conspecifics were shown to have the highest habitat-change activity during dusk and to decrease preference for complex habitats in turbid water. As the behaviours indicate routine responses in the absence of behavioural interactions, E. lucius spatio-temporal distributions should be directly affected and thereby more easily assessed and avoided by prey, with potential consequences for encounter rates.

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources, Section for Population Ecology and Genetics
Pages: 2384-2389
Publication date: 2012
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Fish Biology
Volume: 80
Issue number: 6
ISSN (Print): 0022-1112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.57 SJR 0.741 SNIP 0.882
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.951 SNIP 0.935 CiteScore 1.64
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.944 SNIP 0.934 CiteScore 1.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.049 SNIP 1.118 CiteScore 1.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.035 CiteScore 1.88
Can metabolic properties explain variation in individual behaviour?

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources, Section for Ocean Ecology and Climate
Publication date: 2011
Event: Abstract from 1st International Conference on Fish Telemetry, Sapporo, Japan.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 281697
Publication: Research > Conference abstract for conference – Annual report year: 2011

Can metabolic properties explain variation in individual behaviour? Attempting to link physiology and morphology with field behavior
Dispersal, growth and diet of stocked and wild northern pike fry in a shallow natural lake, with implications for management of stocking programs

Increasing evidence suggests that stocking northern pike Esox lucius has had limited success, especially when age-0 fish are stocked into water bodies where the recruitment of northern pike already occurs. To better understand the ecology of wild and stocked fry, we investigated the dispersal, growth, and food composition of advanced pike fry (~30 mm) stocked at a high density at a common release site in a shallow natural lake that contained wild young-of-the-year (age-0) pike. The stocked pike fry colonized the entire lake shoreline within just a few days. Dispersal was inversely related to size at stocking, suggesting that smaller fish were displaced by competitively superior larger individuals. While the stocked pike were initially larger than the wild age-0 pike, suboptimal growth was evident among the stocked pike and they were smaller than the wild ones at the end of the growing season. Stomach analyses revealed that the stocked pike ingested less diverse prey items and had higher fractions of empty stomachs throughout the study period. Overall, the fraction of stocked pike in samples rapidly declined over the season, which may have been caused by differential survival or immigration into or emigration out of the study system. Our study adds to the existing literature suggesting that the stocking of age-0 northern pike into waters with naturally reproducing pike populations will result in limited success. We propose two potentially complementary explanations for the apparent low fitness of stocked individuals in competition with wild conspecifics: (1) genetic-based local maladaptation among the stocked fish and (2) carryover effects from the hatchery. The latter may be less likely because the fry stocked were the offspring of wild fish and only spent a few weeks in the hatchery.
Disturbance by human activities on fish individual behaviour in a small lake

General Information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Jacobsen, L. (Intern), Baktoft, H. (Intern), Berg, S. (Intern), Jepsen, N. (Intern), Skov, C. (Intern), Aarestrup, K. (Intern)
Publication date: 2011
Event: Abstract from World Recreational Fisheries Congress, Berlin, Germany
Main Research Area: Technical/natural sciences

Geddeyngel skal have planter og lavt vand

General Information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Berg, S. (Intern), Skov, C. (Intern), Olsen, J. S. (Ekstern), Michelsen, K. (Ekstern)
Publication date: 2011
Interplay between temperature, fish partial migration and trophic dynamics

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Brodersen, J. (Ekstern), Nicolle, A. (Ekstern), Nilsson, P. A. (Ekstern), Skov, C. (Intern), Brönmark, C. (Ekstern), Hansson, L. (Ekstern)
Pages: 1838-1846
Publication date: 2011
Main Research Area: Technical/natural sciences

Publication information
Journal: Oikos
Volume: 120
ISSN (Print): 0030-1299
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.68 SJR 2.313 SNIP 1.348
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.389 SNIP 1.346 CiteScore 3.59
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.494 SNIP 1.486 CiteScore 3.69
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.24 SNIP 1.375 CiteScore 3.55
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.364 SNIP 1.419 CiteScore 3.53
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.475 SNIP 1.305 CiteScore 3.28
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.575 SNIP 1.537
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.47 SNIP 1.446
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.648 SNIP 1.502
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.814 SNIP 1.545
Scopus rating (2006): SJR 2.773 SNIP 1.487
Scopus rating (2005): SJR 2.467 SNIP 1.45
Scopus rating (2004): SJR 2.255 SNIP 1.349
Scopus rating (2003): SJR 2.14 SNIP 1.384
Scopus rating (2002): SJR 2.451 SNIP 1.343
Scopus rating (2001): SJR 2.484 SNIP 1.336
Scopus rating (2000): SJR 2.521 SNIP 1.307
Scopus rating (1999): SJR 2.495 SNIP 1.455
Original language: English
Non-indigenous signal crayfish Pacifastacus leniusculus is now common in Danish streams: Preliminary status for national distribution and protective actions

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Aarestrup, K. (Intern), Sivebæk, F. (Intern), Pedersen, S. (Intern), Vrålstad, T. (Ekstern), Berg, S. (Intern)
Pages: 1269-1274
Publication date: 2011
Main Research Area: Technical/natural sciences

Publication information
Journal: Biological Invasions
Volume: 13
Issue number: 6
ISSN (Print): 1387-3547
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 1.294 SNIP 1.193 CiteScore 2.71
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.444 SNIP 1.19 CiteScore 2.58
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.416 SNIP 1.402 CiteScore 2.78
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.553 SNIP 1.29 CiteScore 2.9
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.523 SNIP 1.335 CiteScore 2.79
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.652 SNIP 1.363 CiteScore 3
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.665 SNIP 1.526
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.865 SNIP 1.597
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.59 SNIP 1.478
Scopus rating (2007): SJR 1.481 SNIP 1.268
Scopus rating (2006): SJR 1.607 SNIP 1.445
Scopus rating (2005): SJR 1.035 SNIP 1.516
Scopus rating (2004): SJR 0.957 SNIP 1.199
Scopus rating (2003): SJR 0.803 SNIP 0.857
Scopus rating (2002): SJR 1.336 SNIP 0.994
Pas på slimen

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Sivebæk, F. (Intern)
Pages: 10-14
Publication date: 2011
Main Research Area: Technical/natural sciences

Publication information
Journal: Sportsfiskeren
Issue number: 09
ISSN (Print): 0038-8211
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Electronic versions:
Pas på slimen_2011[1].pdf
Source: orbit
Source-ID: 314131
Publication: Communication › Journal article – Annual report year: 2011

Sizing up your enemy: individual predation vulnerability predicts migratory probability

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Baktoft, H. (Intern), Brodersen, J. (Ekstern), Brönmark, C. (Ekstern), Chapman, B. B. (Ekstern), Hansson, L. (Ekstern), Nilsson, P. A. (Ekstern)
Pages: 1414-1418
Publication date: 2011
Main Research Area: Technical/natural sciences

Publication information
Journal: Proceedings of the Royal Society of London. B - Biological Sciences
Volume: 278
Issue number: 1710
ISSN (Print): 0962-8452
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.89 SJR 2.541 SNIP 1.474
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.948 SNIP 1.535 CiteScore 4.08
The role of ecological context and predation risk-stimuli in revealing the true picture about the genetic basis of boldness evolution in fish

To showcase the importance of genotype × environment interactions and the presence of predation risk in the experimental assessment of boldness in fish, we investigated boldness in terms of feeding behavior and refuge use in two genetically different populations of juvenile carp (Cyprinus carpio) in two replicated experimental conditions in ponds and laboratory tanks. The populations were expected to exhibit genetic differences in boldness due to differential evolutionary adaptation to low-predation-risk pond aquaculture conditions. Boldness was measured in variants of open-field trials with and without implementation of additional predation risk-stimuli by angling on feeding spots. Without explicit implementation of risk, genotypes adapted to low-risk environments, i.e., domesticated mirror carp behaved consistently bolder than their less domesticated scaled conspecifics in the pond environment, but not in the laboratory environment. When we implemented artificial risk-stimuli by angling on previously safe feeding spots, boldness differences among genotypes also emerged in the laboratory environment, indicating strong genotype
To boldly go: individual differences in boldness influence migratory tendency

**General information**

**State:** Published

**Organisations:** Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources

**Authors:** Chapman, B. B. (Ekstern), Hulthén, K. (Ekstern), Blomqvist, D. R. (Ekstern), Hansson, L. (Ekstern), Nilsson, J. (Ekstern), Brodersen, J. (Ekstern), Nilsson, P. A. (Ekstern), Skov, C. (Intern), Brönmark, C. (Ekstern)

**Pages:** 871-876

**Publication date:** 2011

**Main Research Area:** Technical/natural sciences

**Publication information**

**Journal:** Ecology Letters

**Volume:** 14

**Issue number:** 9

**ISSN (Print):** 1461-023X

**Ratings:**

- BFI (2018): BFI-level 2
- Web of Science (2018): Indexed yes
- BFI (2017): BFI-level 2
- Web of Science (2017): Indexed Yes
- BFI (2016): BFI-level 2
- Scopus rating (2016): CiteScore 10.76 SJR 7.634 SNIP 3.405
- Web of Science (2016): Indexed yes
- BFI (2015): BFI-level 2
- Scopus rating (2015): SJR 8.477 SNIP 3.395 CiteScore 10.86
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 2
- Scopus rating (2014): SJR 8.467 SNIP 3.678 CiteScore 11.19
- Web of Science (2014): Indexed yes
- BFI (2013): BFI-level 2
- Scopus rating (2013): SJR 7.933 SNIP 3.489 CiteScore 11.4
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 2
- Scopus rating (2012): SJR 9.224 SNIP 3.613 CiteScore 11.25
- ISI indexed (2012): ISI indexed yes
- Web of Science (2012): Indexed yes
- BFI (2011): BFI-level 2
- Scopus rating (2011): SJR 9.279 SNIP 3.358 CiteScore 10.43
- ISI indexed (2011): ISI indexed yes
- Web of Science (2011): Indexed yes
- BFI (2010): BFI-level 2
- BFI (2009): BFI-level 2
- Scopus rating (2009): SJR 7.774 SNIP 3.257
- BFI (2008): BFI-level 2
- Scopus rating (2008): SJR 8 SNIP 3.155
- Web of Science (2008): Indexed yes
- Scopus rating (2007): SJR 7.859 SNIP 3.017
- Scopus rating (2005): SJR 4.386 SNIP 1.92
- Scopus rating (2004): SJR 3.683 SNIP 1.756
- Scopus rating (2003): SJR 3.673 SNIP 1.745
- Scopus rating (2001): SJR 1.794 SNIP 0.862
Scopus rating (2000): SJR 1.672 SNIP 0.91
Scopus rating (1999): SJR 1.005 SNIP 0.389
Original language: English
DOIs:
10.1111/j.1461-0248.2011.01648.x
Source: orbit
Source-ID: 279112
Publication: Research - peer-review › Journal article – Annual report year: 2011

**Geddehug & månefaser**

**General information**
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern)
Pages: 24-27
Publication date: 2010
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Sportsfiskeren
Volume: 85
Issue number: 8
ISSN (Print): 0038-8211
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Electronic versions:
Sportsfisker_Månefaser_gedder_2010.pdf
Source: orbit
Source-ID: 267355
Publication: Communication › Journal article – Annual report year: 2010

**High salinity tolerance in eggs and fry of a brackish Esox lucius population**

**General information**
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources, Section for Population Ecology and Genetics
Authors: Jørgensen, A. (Ekstern), Hansen, B. (Ekstern), Vismann, B. (Ekstern), Jacobsen, L. (Intern), Skov, C. (Intern), Berg, S. (Intern), Bekkevold, D. (Intern)
Pages: 554-560
Publication date: 2010
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Fisheries Management and Ecology
Volume: 17
ISSN (Print): 0969-997X
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.85 SJR 0.843 SNIP 0.88
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.988 SNIP 1.159 CiteScore 1.91
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.913 SNIP 0.995 CiteScore 1.85
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.737 SNIP 0.807 CiteScore 1.36
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.636 SNIP 0.868 CiteScore 1.32
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.844 SNIP 0.932 CiteScore 1.29
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.847 SNIP 0.808
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.796 SNIP 0.936
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.823 SNIP 0.87
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.813 SNIP 1.255
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.863 SNIP 1.05
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.76 SNIP 0.939
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.418 SNIP 0.674
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.405 SNIP 0.593
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.478 SNIP 0.662
Scopus rating (2001): SJR 0.482 SNIP 0.647
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.414 SNIP 0.68
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 0.514 SNIP 0.574
Original language: English
DOIs:
10.1111/j.1365-2400.2010.00755.x
Source: orbit
Source-ID: 263939
Publication: Research - peer-review › Journal article – Annual report year: 2010

Hvad fiskene laver i søen - døgnet rundt

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Jacobsen, L. (Intern), Baktoft, H. (Intern), Aarestrup, K. (Intern), Berg, S. (Intern), Skov, C. (Intern)
Publication date: 2010
Event: Poster session presented at Tema møde om Fiskeplejens fremtid.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 268793
Publication: Research › Poster – Annual report year: 2010
I hælene på gedden – minut for minut

Influences of environmental cues, migration history and habitat familiarity on partial migration

The factors that drive partial migration in organisms are not fully understood. Roach (Rutilus rutilus), a freshwater fish, engage in partial migration where parts of populations switch between summer habitats in lakes and winter habitats in connected streams. To test if the partial migration trait is phenotypically plastic or has genetic components, we translocated roach from 2 populations with different opportunities for migration to a lake with migration opportunity, containing a local roach population. This enabled monitoring of partial migration of fish in 3 different situations: 1) previous opportunity for migration, migrating in a familiar environment (the local population); 2) previous opportunity for migration, migrating in an unfamiliar environment; and 3) no previous opportunity for seasonal migration, migrating in an unfamiliar environment. In addition, we evaluated the migration patterns of roach in the lake with migration opportunity where from group 2 fish were translocated. Directional migration in and out of the lakes was monitored using Passive Integrated Transponder technology. Translocated fish with previous migration opportunity showed migration patterns more similar to local fish than to their home lake population, and individuals translocated from the lake without migration opportunity migrated when given the opportunity, suggesting that partial migration is phenotypically plastic and triggered by lake-specific environmental cues. We found temperature to be a proximate cue for migration decisions. Individuals without previous migration opportunity migrated at a lower proportion and with different small-scale migration patterns, suggesting that also genetic components are involved in the expression of the partial migration trait.
Lavt vand - en nødvendighed for geddeyngel

**General information**
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Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Berg, S. (Intern), Skov, C. (Intern), Olsen, J. S. (Ekstern), Michelsen, K. (Ekstern)
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Lavt vand - en nødvendighed for geddeyngel
Regime shifts in shallow lakes: the importance of seasonal fish migration

Shallow eutrophic lakes commonly exist in two alternative stable states: a clear-water state and a turbid water state. A number of mechanisms, including both abiotic and biotic processes, buffer the respective states against changes, whereas other mechanisms likely drive transitions between states. Our earlier research shows that a large proportion of zooplanktivorous fish populations in shallow lakes undertake seasonal migrations where they leave the lake during winter and migrate back to the lake in spring. Based on our past research, we propose a number of scenarios of how feedback processes between the individual and ecosystem levels may affect stability of alternative stable states in shallow lakes when mediated by fish migration. Migration effects on shallow lakes result from processes at different scales, from the individual to the ecosystem. Our earlier research has shown that ecosystem properties, including piscivore abundance and zooplankton productivity, affect the individual state of zooplanktivorous fish, such as growth rate or condition. Individual state, in turn, affects the relative proportion and timing of migrating zooplanktivorous fish. This change, in turn, may stabilize states or cause runaway processes that eventually lead to state shifts. Consequently, such knowledge of processes coupled to seasonal migration of planktivorous fish should increase our understanding of shallow lake dynamics.

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources, Lund University
Authors: Brönmark, C. (Ekstern), Brodersen, J. (Ekstern), Chapman, B. B. (Ekstern), Nicolle, A. (Ekstern), Nilsson, P. A. (Ekstern), Skov, C. (Intern), Hansson, L. (Ekstern)
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Turbiditet i søer - effekter på rov aborrens adfærd

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Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Jacobsen, L. (Intern), Berg, S. (Intern), Andersen, M. (Intern), Skov, C. (Intern)
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Event: Abstract from Ferskvandssymposiet, Roskilde, Denmark.
Main Research Area: Technical/natural sciences
Publication: Research – Conference abstract for conference – Annual report year: 2010
Vintervandringer hos søfisk

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Authors: Skov, C. (Intern)
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Main Research Area: Technical/natural sciences

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Volume: 19
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Original language: Danish
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   naturvejleder_2010-4_web.pdf
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Alternative perch strategy in low visibility lakes?

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Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Jacobsen, L. (Intern), Skov, C. (Intern), Berg, S. (Intern)
Publication date: 2009
Event: Abstract from The 8. Fish Telemetry Conference, Umeå, Sweden, .
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 252606
Publication: Research › Conference abstract for conference – Annual report year: 2009

Environmental conditions and intraspecific interference: unexpected effects of turbidity on pike (Esox lucius) foraging
Interference among predators decreases per capita foraging rates and has implications for both community dynamics and top-down trophic processes. Interference originates from behavioural interactions among foragers, and these behaviours could be affected by environmental conditions. In experiments on pike foraging alone or among conspecifics in different levels of water turbidity, we expected high turbidity to decrease the perceived risk of intraspecific interactions among pike, and thereby decrease the strength of interference, as turbidity would decrease the visual contact between individuals and act as a refuge from behavioural interactions. The results show that this is not the case, but suggest that interference is induced instead of reduced in high turbidity. Per capita foraging rates do not differ between pike foraging alone or in groups in our clear and moderately turbid treatments, indicating no effect of interference. As high turbidity enhances prey consumption for pike individuals foraging alone, but does not have this effect for pike in groups, high turbidity induces the relative interference effect. We suggest that future evaluations of the stabilizing effects of interference on community dynamics and its reduction of predation impact on top-down trophic cascades should consider potential unexpected effects of environmental conditions.

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Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Nilsson, P. (Ekstern), Jacobsen, L. (Intern), Berg, S. (Intern), Skov, C. (Intern)
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Gedder i brakvand - bestandsophælpning ved udsætning

General information
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Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Jacobsen, L. (Intern), Skov, C. (Intern), Berg, S. (Intern), Koed, A. (Intern), Larsen, P. F. (Intern)
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Journal: Fisk og Hav
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Authors: Skov, C. (Intern)
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New insights in pike behaviour

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Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Baktoft, H. (Intern), Jacobsen, L. (Intern), Berg, S. (Intern), Aarestrup, K. (Intern), Skov, C. (Intern), Svendsen, J. C. (Intern)
Publication date: 2009
Event: Abstract from PhD Student Seminar, Søminestationen, Holbæk, Danmark, .
Main Research Area: Technical/natural sciences
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New insights in pike behaviour using 2D/3D telemetry

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Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources, Mathematical Statistics, Department of Informatics and Mathematical Modeling
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Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 252533
Piscivory and trophic position of Anguilla anguilla in two lakes: importance of macrozoobenthos density

The feeding habits of the European eel Anguilla anguilla (> 300 mm total length, L-T) were compared in two lakes of different environmental state: Lake Grosser Vatersee (LGV), Germany (clear water, mesotrophic and submerged macrophytes), and Lake Vallum (LV), Denmark (turbid, eutrophic and no submerged macrophytes). The density of macrozoobenthos was higher in LV (3500 individuals m\(^{-2}\)) than in LGV (1500 individuals m\(^{-2}\)). The abundance of small prey fishes (40-99 mm L-T) was highest in LV. In LV, A. anguilla fed on macrozoobenthos, in particular, chironomid larvae. In LGV, A. anguilla used fishes as the main food component. Stable isotope analyses confirmed the stomach contents dietary results. The estimated mean +/- s.d. trophic positions of A. anguilla in LGV (3 center dot 7 +/- 0 center dot 2) was one level higher than those of fish in LV (2 center dot 7 +/- 0 center dot 2). Based on these results, it is concluded that piscivory among A. anguilla was generally controlled by the density of macrozoobenthos. Stable isotope analysis further indicated that A. anguilla may act as integrators between benthic and pelagic food webs when density of insect larvae is low.
Restoring lakes by using artificial plant beds: habitat selection of zooplankton in a clear and a turbid shallow lake

1. Return of large-bodied zooplankton populations is of key importance for creating a shift from a turbid to a clear-water state in shallow lakes after a nutrient loading reduction. In temperate lakes, recovery is promoted by submerged macrophytes which function as a daytime refuge for large zooplankton. However, recovery of macrophytes is often delayed and use of artificial plant beds (APB) has been suggested as a tool to enhance zooplankton refuges, thereby reinforcing the shift to a clear-water state and, eventually, colonisation of natural plants. 2. To further evaluate the potential of APB in lake restoration, we followed the day–night habitat choices of zooplankton throughout summer in a clear and a turbid lake. Observations were made in the pelagic and littoral zones and in APB in the littoral representing three different plant densities (coverage 0%, 40% and 80%). 3. In the clear lake, the zooplankton (primarily Daphnia) were mainly found in the pelagic area in spring, but from mid-May they were particularly abundant in the APB and almost exclusively so in mid-June and July, where they appeared in extremely high densities during day (up to 2600 ind. L⁻¹). During night
Daphnia densities were overall more equally distributed between the five habitats. Ceriodaphnia was proportionally more abundant in the APB during most of the season. Cyclopoids were more abundant in the high APB during day but were equally distributed between the five habitats during night. 4. In the turbid lake, however, no clear aggregation was observed in the APB for either of the pelagic genera (Daphnia and Bosmina). This may reflect a higher refuge effect in the open water due to the higher turbidity, reduced ability to orient to plant beds and a significantly higher fish density (mainly of roach, Rutilus rutilus, and perch, Perca fluviatilis) in the plant beds than in the clear lake. Chydorus was found in much higher proportions among the plants, while cyclopoids, particularly the pelagic Cyclops vicinus, dominated in the pelagic during day and in the pelagic and high density plants during night. 5. Our results suggest that water clarity is decisive for the habitat choice of large-bodied zooplankton and that introduction of APB as a restoration measure to enhance zooplankton survival is only a useful tool when water clarity increases following loading reduction. Our results indicate that dense APB will be the most efficient.

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Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Schou, M. O. (Ekstern), Risholt, C. (Ekstern), Lauridsen, T. L. (Ekstern), Søndergaard, M. (Ekstern), Grønkjær, P. (Ekstern), Jacobsen, L. (Intern), Berg, S. (Intern), Skov, C. (Intern), Brucet, S. (Ekstern), Jeppesen, E. (Ekstern)
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BFI (2018): BFI-level 2
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BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.36 SJR 1.568 SNIP 1.41
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 1.537 SNIP 1.371 CiteScore 2.95
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 1.487 SNIP 1.473 CiteScore 3.03
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.045 SNIP 1.9 CiteScore 4.02
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.075 SNIP 1.755 CiteScore 3.76
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 1.927 SNIP 1.628 CiteScore 3.33
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 1.736 SNIP 1.525
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 1.734 SNIP 1.514
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.618 SNIP 1.502
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.741 SNIP 1.701
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.943 SNIP 1.869
Partial migration is a common phenomenon among many animals and occurs in many types of ecosystems. Understanding the mechanisms behind partial migration is of major importance for the understanding of population dynamics and, eventually, ecosystem processes. We studied the effects of food availability on the seasonal partial migration of cyprinid fish from a lake to connected streams during winter by the use of passive telemetry. Fish with increased access to food were found to migrate in higher proportion, earlier in the season, and to reside in the streams for a longer period compared to fish with decreased access to food. Furthermore, fewer unfed migrants returned to the lake, indicating higher overwinter mortality. Our results suggest that individual fish trade off safety from predation and access to food differently depending on their body condition, which results in a condition-dependent partial migration. Hence, our main conclusion is that individual decision-making is based on assessment of own condition which offers a mechanistic explanation to partial migration. Moreover, this may be of high importance for understanding population responses to environmental variation as well as ecosystem dynamics and stability.
Current and future directions for pike ecology and management: a summary and synthesis

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Nilsson, P. (Ekstern), Skov, C. (Intern), Farrell, J. (Ekstern)
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Scopus rating (2016): CiteScore 2.27
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.16
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.22
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.02
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.13
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 1.98
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
BFI (2008): BFI-level 1
Web of Science (2008): Indexed yes
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Web of Science (2001): Indexed yes
Original language: English
DOIs:
10.1007/s10750-007-9260-5
Source: orbit
Source-ID: 226952
Inter- and size-specific patterns of fish seasonal migration between a shallow lake and its streams
This study used passive telemetry (passive integrated transponders) to evaluate winter migration in three species of cyprinids (roach (Rutilus rutilus (L.)), white bream (Blicca bjoerkna (L.)) and rudd (Scardinius erythrophthalmus (L.))) and their potential predators (pike (Esox lucius (L.)) and perch (Perca fluviatilis (L.))) between a shallow lake and its streams. Migration patterns were investigated from October to June, and a substantial part of the roach (40%) and white bream (55%) populations tagged in the lake during autumn migrated during winter into the streams, whereas only very few piscivores (<2%) migrated. In contrast to roach and white bream, only few rudd (<6%) migrated, which is likely a consequence of different overwintering strategies, e.g., rudd overwintering in shallow highly structured habitats. Small rudd migrated more than larger rudd, whereas there were no size-differentiated migration patterns for roach or white bream. Migration of the cyprinid fishes was generally initiated in late October and ended in May, and specific synchronised bursts of migration were observed in December, January and April, suggesting that migration is triggered by one or more proximate environmental cues. The cyprinid fishes generally entered the streams in late afternoon or in the morning, depending on season, but overall migration patterns varied between the three streams. We suggest and discuss that our results have great implications for lake management as well as for the interpretation of seasonal trophic dynamics in shallow lakes.

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Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Brodersen, J. (Ekstern), Nilsson, P. (Ekstern), Hansson, L. (Ekstern), Brönmark, C. (Ekstern)
Pages: 406-415
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.66 SJR 0.804 SNIP 0.885
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.022 SNIP 1.192 CiteScore 1.92
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.866 SNIP 0.994 CiteScore 1.58
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.971 SNIP 1.072 CiteScore 1.77
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.061 SNIP 1.247 CiteScore 2.05
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.979 SNIP 0.887 CiteScore 1.65
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.812 SNIP 0.968
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Optimal swimming speed in head currents and effects on distance movement of winter-migrating fish
Migration is a commonly described phenomenon in nature that is often caused by spatial and temporal differences in habitat quality. However, as migration requires energy, the timing of migration may depend not only on differences in habitat quality, but also on temporal variation in migration costs. Such variation can, for instance, arise from changes in wind or current velocity for migrating birds and fish, respectively. Whereas behavioural responses of birds to such changing environmental conditions have been relatively well described, this is not the case for fish, although fish migrations are both ecologically and economically important. We here use passive and active telemetry to study how
winter migrating roach regulate swimming speed and distance travelled per day in response to variations in head current velocity. Furthermore, we provide theoretical predictions on optimal swimming speeds in head currents and relate these to our empirical results. We show that fish migrate farther on days with low current velocity, but travel at a greater ground speed on days with high current velocity. The latter result agrees with our predictions on optimal swimming speed in head currents, but disagrees with previously reported predictions suggesting that fish ground speed should not change with head current velocity. We suggest that this difference is due to different assumptions on fish swimming energetics. We conclude that fish are able to adjust both swimming speed and timing of swimming activity during migration to changes in head current velocity in order to minimize energy use.

**General information**

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Authors: Brodersen, J. (Ekstern), Nilsson, P. (Ekstern), Ammitzbøl, J. (Ekstern), Hansson, L. (Ekstern), Skov, C. (Intern), Brönmark, C. (Ekstern)
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.414 SNIP 1.131 CiteScore 3.32
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.545 SNIP 1.141 CiteScore 3.54
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.74 SNIP 1.147 CiteScore 3.94
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.945 SNIP 1.142 CiteScore 4.15
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 2.369 SNIP 1.23 CiteScore 4.58
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 2.631 SNIP 1.161
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 2.473 SNIP 0.985
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
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Preface to the International Pike Symposium: merging knowledge of ecology, biology, and management for a circumpolar species

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Scopus rating (2016): CiteScore 2.27
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 2.16
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.22
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.02
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.13
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 1.98
ISI indexed (2011): ISI indexed yes
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General information
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Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Jacobsen, L. (Intern), Berg, S. (Intern), Skov, C. (Intern), Aarestrup, K. (Intern), Pedersen, M. I. (Intern)
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Main Research Area: Technical/natural sciences

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Journal: Fisheries Management and Ecology
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BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.85 SJR 0.843 SNIP 0.88
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.988 SNIP 1.159 CiteScore 1.91
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.913 SNIP 0.995 CiteScore 1.85
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.737 SNIP 0.807 CiteScore 1.36
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.636 SNIP 0.868 CiteScore 1.32
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.844 SNIP 0.932 CiteScore 1.29
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.847 SNIP 0.808
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.796 SNIP 0.936
BFI (2008): BFI-level 1
Seasonal migration determined by a trade-off between predator avoidance and growth

Migration is a common phenomenon in many organisms, terrestrial as well as aquatic, and considerable effort has been spent to understand the evolution of migratory behaviour and its consequences for population and community dynamics. In aquatic systems, studies on migration have mainly been focused on commercially important fish species, such as salmon and trout. However, seasonal mass-migrations may occur also among other freshwater fish, e.g. in cyprinids that leave lakes and migrate into streams and wetlands in the fall and return back to the lake in spring. In a conceptual model, we hypothesized that this is an adaptive behaviour in response to seasonal changes in predation (P) and growth (G) and that migrating fish change habitat so as to minimise the ratio between predation mortality and growth rate (P/G). Estimates from bioenergetic modelling showed that seasonal changes in the ratio between predator consumption rate and prey growth rate followed the predictions from the conceptual model and also gave more precise predictions for the timing of the habitat change. By quantifying the migration of more than 1800 individually marked fish, we showed that actual migration patterns followed predictions with a remarkable accuracy, suggesting that migration patterns have evolved in response to seasonally fluctuating trade-offs between predator avoidance and foraging gains. Thus, the conceptual model provides a mechanistic understanding to mass–migration in prey fish. Further, we also show that the dominant prey fish is actually absent from the lake during a major part of the year, which should have strong implications for the dynamics of the lake ecosystem through direct and indirect food-web interactions.

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Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources, Lund University
Authors: Brönmark, C. (Ekstern), Skov, C. (Intern), Brodersen, J. (Ekstern), Nilsson, P. (Ekstern), Hansson, L. (Ekstern)
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Main Research Area: Technical/natural sciences

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Volume: 3
Issue number: 4
ISSN (Print): 1932-6203
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
Søørreder i Hald Sø skal nu undersøges

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Koed, A. (Intern), Skov, C. (Intern)
Publication date: 2008
Main Research Area: Technical/natural sciences

Publication information
Journal: www.fiskepleje.dk

Bibliographical note
Open Access
Source: orbit
Source-ID: 225023
Publication: Research - peer-review › Journal article – Annual report year: 2008
Survival and behaviour of European silver eel in late freshwater and early marine phase during spring migration

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Aarestrup, K. (Intern), Thorstad, E. (Ekstern), Koed, A. (Intern), Jepsen, N. (Intern), Svendsen, J. C. (Intern), Pedersen, M. I. (Intern), Skov, C. (Intern), Okland, F. (Ekstern)
Pages: 435-440
Publication date: 2008
Main Research Area: Technical/natural sciences

Publication information
Journal: Fisheries Management and Ecology
Volume: 15
Issue number: 5-6
ISSN (Print): 0969-997X
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.85 SJR 0.843 SNIP 0.88
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.988 SNIP 1.159 CiteScore 1.91
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.913 SNIP 0.995 CiteScore 1.85
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.737 SNIP 0.807 CiteScore 1.36
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.636 SNIP 0.868 CiteScore 1.32
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.844 SNIP 0.932 CiteScore 1.29
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.847 SNIP 0.808
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.796 SNIP 0.936
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.823 SNIP 0.87
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.813 SNIP 1.255
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.863 SNIP 1.05
Web of Science (2006): Indexed yes
Temporal clumping of prey and coexistence of unequal interferers: experiments on social forager groups of brown trout feeding on invertebrate drift

Environmental fluctuations have been proposed to enhance the coexistence of competing phenotypes. Evaluations are here presented on the effects of prey density and short-term temporal clumping of prey availability on the relative foraging success of unequal interferers in social forager groups of juvenile brown trout Salmo trutta feeding on drifting invertebrate prey (frozen chironomids). Groups of three trout with established linear dominance hierarchies (dominant, intermediate and subordinate) were subjected to three different total numbers of prey, combined with three different levels of temporal clumping of prey arrival, resulting in nine treatment combinations. Higher total number of prey increased the consumption for all dominance ranks, while higher temporal clumping decreased the consumption for the dominant individuals and increased the consumption for the subordinate individuals. The proportion of prey eaten was smaller at high prey numbers. Similarly, there was a trend that increased temporal clumping also decreased the proportion of prey eaten. We conclude that density and temporal clumping of prey contribute to the coexistence of unequal interferers, and that there is a potential positive feedback between prey behaviour and phenotypic coexistence through decreased per capita predation risk for prey that drift synchronously in high densities.

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Jonsson, M. (Ekstern), Skov, C. (Intern), Koed, A. (Intern), Nilsson, A. P. (Ekstern)
Pages: 1782-1787
Publication date: 2008
Main Research Area: Technical/natural sciences

Publication information
Journal: Oikos
Volume: 117
Issue number: 12
ISSN (Print): 0030-1299
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.68 SJR 2.313 SNIP 1.348
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.389 SNIP 1.346 CiteScore 3.59
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.494 SNIP 1.486 CiteScore 3.69
Turbidity increases behavioural diversity in northern pike, *Esox lucius* L., during early summer

**General information**

State: Published  
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources  
Authors: Andersen, M. (Ekstern), Jacobsen, L. (Intern), Grønkjær, P. (Ekstern), Skov, C. (Intern)  
Pages: 377-383  
Publication date: 2008  
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Fisheries Management and Ecology  
Volume: 15  
Issue number: 5-6  
ISSN (Print): 0969-997X  
Ratings:  
BFI (2018): BFI-level 1  
Web of Science (2018): Indexed yes  
BFI (2017): BFI-level 1  
Web of Science (2017): Indexed Yes  
BFI (2016): BFI-level 1  
Scopus rating (2016): CiteScore 1.85 SJR 0.843 SNIP 0.88  
BFI (2015): BFI-level 1  
Scopus rating (2015): SJR 0.988 SNIP 1.159 CiteScore 1.91
Udsætning af geddeyngel som bestandsophøjelpning i danske brakvandsområder – effektvurdering og perspektivering

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Jacobsen, L. (Intern), Skov, C. (Intern), Berg, S. (Intern), Koed, A. (Intern), Larsen, P. F. (Intern)
Number of pages: 54
Publication date: 2008

Publication information
Place of publication: Silkeborg
Publisher: DTU Aqua. Institut for Akvatiske Ressourcer
Consequences of fish predation, migration and juvenile ontogeny on zooplankton spring dynamics

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Hansson, L. (Ekstern), Nicolle, A. (Ekstern), Brodersen, J. (Ekstern), Romare, P. (Ekstern), Nilsson, P. (Ekstern), Brönmark, C. (Ekstern), Skov, C. (Intern)
Pages: 696-706
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: Limnology and Oceanography
Volume: 52
Issue number: 2
ISSN (Print): 0024-3590
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.5 SJR 1.712 SNIP 1.225
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 2.472 SNIP 1.422 CiteScore 3.93
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.112 SNIP 1.584 CiteScore 3.73
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 2.256 SNIP 1.587 CiteScore 3.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 2.456 SNIP 1.5 CiteScore 3.81
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 2.374 SNIP 1.445 CiteScore 3.59
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.38 SNIP 1.425
Web of Science (2010): Indexed yes
Evaluating stocking of YOY pike *Esox lucius* as a tool in the restoration of shallow lakes

1. Stocking of piscivores in shallow, eutrophicated lakes to reduce cyprinid densities is a common approach in lake restorations. Young-of-the-year (YOY) pike *Esox lucius* are frequently used to reduce cyprinid densities, but their effectiveness is equivocal. This study uses a simple model to assess the efficacy of pike stocking as a lake restoration tool.

2. The model evaluates YOY pike consumption in relation to different survival and growth patterns, timing of stocking, degree of piscivory of pike as well as YOY cyprinid growth patterns and productivity. The parameters used in the model are obtained from field surveys in eight study lakes stocked with YOY pike as well as from the literature.

3. Our model showed that all parameters studied were important for predicting the effects of pike stocking on cyprinids. In particular, body size at stocking, cyprinid production and pike survival were good predictors of biomanipulation success.

4. However, our model showed that only under very specific circumstances will stocking of YOY pike result in a reduction of YOY cyprinid densities large enough to affect water quality.

5. The findings of this study question the efficacy of pike stocking as an appropriate and reliable tool for restoration programmes in shallow lakes, and indicate that when used efforts should be made to optimize the timing of stocking in relation to YOY cyprinid production and to increase the stocking body size of the pike.
Habitat-choice interactions between pike predators and perch prey depend on water transparency

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Nilsson, P. (Ekstern), Jacobsen, L. (Intern), Brönmark, C. (Ekstern)
Pages: 298-302
Publication date: 2007

Original language: English
DOIs: 10.1111/j.1365-2427.2007.01795.x
Source: orbit
Source-ID: 227427
Publication: Research - peer-review › Journal article – Annual report year: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Fish Biology
Volume: 70
Issue number: 1
ISSN (Print): 0022-1112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.57 SJR 0.741 SNIP 0.882
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.951 SNIP 0.935 CiteScore 1.64
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.944 SNIP 0.934 CiteScore 1.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.049 SNIP 1.118 CiteScore 1.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.035 CiteScore 1.88
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.895 SNIP 0.946 CiteScore 1.66
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.774 SNIP 0.834
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.773 SNIP 0.891
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.883 SNIP 0.968
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.996 SNIP 1.06
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.897 SNIP 1.051
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.827 SNIP 0.898
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.945 SNIP 1.148
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.937 SNIP 1.096
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 0.949 SNIP 1.056
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 0.874 SNIP 1.1
Lake restoration: successes, failures and long-term effects

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Søndergaard, M. (Ekstern), Jeppesen, E. (Ekstern), Lauridsen, T. (Ekstern), Skov, C. (Intern), Van Nes, E. (Ekstern), Roijackers, R. (Ekstern), Lammens, E. (Ekstern), Portielje, R. (Ekstern)
Pages: 1095-1105
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Applied Ecology
Volume: 44
Issue number: 6
ISSN (Print): 0021-8901
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.5 SJR 2.869 SNIP 2.008
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): SJR 3.242 SNIP 1.96 CiteScore 5.38
BFI (2014): BFI-level 2
Scopus rating (2014): SJR 2.998 SNIP 2.171 CiteScore 5.25
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): SJR 3.031 SNIP 2.225 CiteScore 5.45
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): SJR 3.122 SNIP 2.089 CiteScore 5.18
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): SJR 3.665 SNIP 2.294 CiteScore 5.23
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 3.091 SNIP 2.014
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 3.22 SNIP 2.112
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 3.08 SNIP 2.252
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 3.494 SNIP 2.592
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 3.095 SNIP 2.385
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 3.124 SNIP 2.257
Scopus rating (2004): SJR 2.709 SNIP 2.134
Scopus rating (2003): SJR 3.09 SNIP 2.121
Scopus rating (2002): SJR 2.682 SNIP 1.744
Scopus rating (2001): SJR 2.128 SNIP 1.69
Scopus rating (2000): SJR 1.935 SNIP 1.523
Scopus rating (1999): SJR 1.663 SNIP 1.56
Original language: English
DOIs: 10.1111/j.1365-2664.2007.01363.x
Source: orbit
Source-ID: 227621
Publication: Research - peer-review › Journal article – Annual report year: 2007

Restaurering af søer: Udsætning af gedder

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources, Section for Population Ecology and Genetics
Authors: Skov, C. (Intern), Berg, S. (Intern), Jacobsen, L. (Intern), Bekkevold, D. (Intern), Olsen, J. (Ekstern)
Pages: 129-134
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: Vand og jord
Volume: 4
ISSN (Print): 0908-7761
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Source: orbit
Source-ID: 227449
Publication: Research › Journal article – Annual report year: 2007

Seasonal migration in cyprinid fish: Causes and consequences

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Brodersen, J. (Ekstern), Bronmark, C. (Ekstern), Skov, C. (Intern), Nilsson, P. A. (Ekstern), Hansson, L. (Ekstern)
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: Ecological Society of America Annual Meeting Abstracts
Original language: English
potential growth rate, predation rate, seasonal migration, Animalia (Animals) - Animalia [33000] zooplankton common, Pisces Vertebrata Chordata Animalia (Animals, Chordates, Fish, Nonhuman Vertebrates, Vertebrates) - Osteichthyes [85206] perch common cyprinid common roach common pike common silver bream common, 00520, General biology - Symposia, transactions and proceedings, 07002, Behavioral biology - General and comparative behavior, 07003,
Short-term salinity tolerance of northern pike, *Esox lucius*, fry, related to temperature and size

The short-term tolerances of northern pike, *Esox lucius* L., fry reared in a freshwater hatchery, to salinity were examined in the laboratory. Survival of two size groups of pike fry (mean length 21 +/- 2 mm SD and 37 +/- 4 mm SD) was examined over 72- to 96-h periods at 9-14 ppt salinity in combination with temperatures of 10, 14 and 18 degrees C. A parametric survival model found a significant correlation between survival of pike fry and temperature and salinity, respectively. L(C)50 values after 72 h were between 11.2 and 12.2 ppt, being lowest at 10 degrees C. Pike fry did not survive more than 13 ppt. Mortality at 12 ppt was significantly faster at 18 degrees C than 10 or 14 degrees C. Moreover, mortality was higher and faster for large than for small pike fry at 12 ppt and 14 degrees C. These results imply that pike raised in fresh water can survive stocking into brackish waters below 11 ppt at least for a short time.
Size-dependent predator-prey relationships between pikeperch and their prey fish

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Dörner, H. (Ekstern), Hülsmann, S. (Ekstern), Höker, F. (Ekstern), Skov, C. (Intern), Wagner, A. (Ekstern)
Pages: 307-314
Publication date: 2007
Main Research Area: Technical/natural sciences

Publication information
Journal: Ecology of Freshwater Fish
Volume: 16
Issue number: 3
ISSN (Print): 0906-6691
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.66 SJR 0.804 SNIP 0.885
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.022 SNIP 1.192 CiteScore 1.92
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.866 SNIP 0.994 CiteScore 1.58
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.971 SNIP 1.072 CiteScore 1.77
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
The effect of turbidity on diel activity and habitat choice of adult pike (*Esox lucius L.*)

**General information**
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Andersen, M. (Ekstern), Jacobsen, L. (Intern), Grønkjær, P. (Ekstern), Skov, C. (Intern)
Publication date: 2007
Event: Poster session presented at The 7th Conference on Fish Telemetry held in Europe. Silkeborg, Denmark, 17-22 June, Silkeborg, Denmark.
Main Research Area: Technical/natural sciences

Do pike really suffer in poor visibility?

**General information**
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Jacobsen, L. (Intern), Nilsson, A. (Ekstern), Jensen, H. (Ekstern), Müller, J. (Ekstern)
Publication date: 2006
Event: Abstract from International Pike Symposium: Merging knowledge of Ecology, Biology and Management for a Circumpolar Species, Lake Placid, USA.
Main Research Area: Technical/natural sciences

Gedder i de indre søer 2005 - habitatforbedring og naturlig gydning

**General information**
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Berg, S. (Intern), Skov, C. (Intern)
Number of pages: 13
Publication date: 2006
Gedder indtager hurtigt nyskabte søer

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Koed, A. (Intern), Falck-Rasmussen, K. (Ekstern), Sivebæk, F. (Intern)
Pages: 8
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information
Journal: Sportsfiskeren
Volume: 81
Issue number: 2
ISSN (Print): 0038-8211
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Source: orbit
Source-ID: 227433
Publication: Research › Journal article – Annual report year: 2006

Migration patterns of brackish water pikes in South Denmark

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Jacobsen, L. (Intern), Skov, C. (Intern), Berg, S. (Intern), Koed, A. (Intern)
Publication date: 2006
Event: Abstract from Pike Symposium at the American Fisheries Society annual meeting, Lake Placid, USA, .
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 277778
Publication: Research › Conference abstract for conference – Annual report year: 2006

Nyt syn på udsætning af geddeyngel

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Berg, S. (Intern), Skov, C. (Intern)
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information
Journal: fiskepleje.dk
Original language: Danish
Links:
http://www.fiskepleje.dk/default.asp?getreq=%2Fgedderapport%2Ehtm
Source: orbit
Source-ID: 224918
Preface to the Silkeborg conference issue

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Jacobsen, L. (Intern), Koed, A. (Intern), Aarestrup, K. (Intern), Skov, C. (Intern), Jepsen, N. (Intern), Berg, S. (Intern)
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information
Journal: Ecology of Freshwater Fish
Volume: 15
Issue number: 2
ISSN (Print): 0906-6691
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.66 SJR 0.804 SNIP 0.885
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.022 SNIP 1.192 CiteScore 1.92
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.866 SNIP 0.994 CiteScore 1.58
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.971 SNIP 1.072 CiteScore 1.77
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.061 SNIP 1.247 CiteScore 2.05
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.979 SNIP 0.887 CiteScore 1.65
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.812 SNIP 0.968
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.817 SNIP 1.006
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 0.932 SNIP 0.985
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.791 SNIP 0.883
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.875 SNIP 1.183
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.659 SNIP 0.92
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 0.907 SNIP 1.191
The diet of large eels in relation to food availability

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Dörner, H. (Ekstern), Skov, C. (Intern), Berg, S. (Intern), Schulze, T. (Ekstern), Beare, D. (Ekstern), Van der Velde, G. (Ekstern)
Pages: 1-30
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information
Journal: ICES Council Meeting
ISSN (Print): 1015-4744
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Web of Science (2003): Indexed yes
Original language: English
Links:
Source: orbit
Source-ID: 225933
Publication: Research › Journal article – Annual report year: 2006

Udsætning af geddeyngel i danske søer: Effektvurdering og perspektivering

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources, Section for Population Ecology and Genetics
Authors: Skov, C. (Intern), Jacobsen, L. (Intern), Berg, S. (Intern), Olsen, J. (Ekstern), Bekkevold, D. (Intern)
Number of pages: 96
Publication date: 2006

Publication information
Place of publication: Silkeborg
Publisher: Danmarks Fiskeriundersøgelser
Original language: Danish
Series: DFU-rapport
Number: 161-06
Main Research Area: Technical/natural sciences
Electronic versions:
DFU-rapport 161-06, elektronisk.pdf
Udsætning af geddeyngel som redskab i biomanipulation i Danmark - Baggrund og forløb

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Berg, S. (Intern), Skov, C. (Intern)
Publication date: 2006
Main Research Area: Technical/natural sciences

Publication information
Journal: fiskepleje.dk
Original language: Danish
Links:
http://www.dfu.min.dk/fiskepleje/geddenotat.htm
Source: orbit
Source-ID: 224933
Publication: Research › Journal article – Annual report year: 2006

Biomanipulation by pike stocking: cross analysis of 8 Danish restoration projects

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Jacobsen, L. (Intern), Berg, S. (Intern)
Publication date: 2005
Event: Abstract from Shallow lakes in a changing world, Dalfsen, The Netherlands,
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 279382
Publication: Research › Conference abstract for conference – Annual report year: 2005

Evaluation of PIT-tagging in cyprinids
Laboratory and field experiments were used to investigate how different marking procedures, with 23 mm PIT (passive integrated transponders) - tags, affected mortality, body condition and tag expulsion in small roach Rutilus rutilus and rudd Scardinus erythrophthalmus (117 to 163 mm total length). In a laboratory experiment mortality was low (}

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Skov, C. (Intern), Brodersen, J. (Ekstern), Brönmark, C. (Ekstern), Hansson, L. (Ekstern), Hertonsson, P. (Ekstern), Nilsson, P. (Ekstern)
Pages: 1195-1201
Publication date: 2005
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Fish Biology
Volume: 67
Issue number: 5
ISSN (Print): 0022-1112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
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Original language: English

Aquatic Science, Fulton's K, Marking evaluation, Mortality, Passive integrated transponders, Small cyprinids, body condition, cyprinid, experimental study, growth rate, mortality, tagging, Cyprinidae, Pisces, Rutilus rutilus, FISHERIES, TRANSMITTERS, marking evaluation, passive integrated transponders, small cyprinids, mortality rate, tag expulsion, Pisces Vertebrata Chordata Animalia (Animals, Chordates, Fish, Nonhuman Vertebrates, Vertebrates) - Osteichthyes [85206] Rutilus rutilus species roach common Scardinius erythrophthalmus species rudd common cyprinid common, 07002, Behavioral biology - General and comparative behavior, 07003, Behavioral biology - Animal behavior, passive integrated transponder PIT field equipment, Behavior, Equipment Apparatus Devices and Instrumentation

DOIs:
Gedder i de Indre Søer 2004 - habitatforbedring, udsætning og naturlig gydning

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Olsen, J. (Ekstern), Berg, S. (Intern), Skov, C. (Intern)
Number of pages: 22
Publication date: 2005

Publication information
Place of publication: København
Publisher: BST Københavns Kommune
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 226973
Publication: Research › Report – Annual report year: 2005

Migration patterns of brackish water pikes in South Denmark

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Jacobsen, L. (Intern), Skov, C. (Intern), Berg, S. (Intern), Koed, A. (Intern)
Publication date: 2005
Event: Abstract from Telemetry Conference to be held in Europe, Sesimbra, Portugal
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 279379
Publication: Research › Conference abstract for conference – Annual report year: 2005

Does roach behaviour differ between shallow lakes of different environmental state?

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Jacobsen, L. (Intern), Berg, S. (Intern), Jepsen, N. (Intern), Skov, C. (Intern)
Pages: 135-147
Publication date: 2004
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Fish Biology
Volume: 65
Issue number: 1
ISSN (Print): 0022-1112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
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BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.57 SJR 0.741 SNIP 0.882
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.951 SNIP 0.935 CiteScore 1.64
Effect of turbidity on habitat selection and activity of fish in shallow lakes during a year

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Jacobsen, L. (Intern), Berg, S. (Intern), Skov, C. (Intern), Jepsen, N. (Intern)
Publication date: 2004
Event: Abstract from International Conference on Behaviour and ecology of freshwater fish, linking ecology and individual behaviour, Silkeborg, Denmark.
Habitat use of 0+-year pike in experimental ponds in relation to cannibalism, zooplankton, water transparency and habitat complexity

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Koed, A. (Intern)
Pages: 448-459
Publication date: 2004
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Fish Biology
Volume: 64
Issue number: 2
ISSN (Print): 0022-1112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
How to link biomanipulation and sustainable fisheries management: a step-by-step guideline for lakes of the European temperate zone
Otolith-based analysis of survival and size-selective mortality of stocked 0+ year pike related to time of stocking

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Grønkjær, P. (Ekstern), Skov, C. (Intern), Berg, S. (Intern)
Pages: 1625-1637
Publication date: 2004
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Fish Biology
Volume: 64
Issue number: 6
ISSN (Print): 0022-1112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.57 SJR 0.741 SNIP 0.882
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.951 SNIP 0.935 CiteScore 1.64
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.944 SNIP 0.934 CiteScore 1.76
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.049 SNIP 1.118 CiteScore 1.98
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.93 SNIP 1.035 CiteScore 1.88
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.895 SNIP 0.946 CiteScore 1.66
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
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Scopus rating (2008): SJR 0.883 SNIP 0.968
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Web of Science (2006): Indexed yes
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Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.751 SNIP 0.993
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.025 SNIP 1.176
Original language: English
Source: orbit
Source-ID: 225574
Publication: Research - peer-review › Journal article – Annual report year: 2004
Udsætning af geddeyngel i Københavns indre søer 2003: Overlevelse, habitatvalg, fødevalg, vækst og afledte effekter

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Olsen, J. (Ekstern), Berg, S. (Intern), Skov, C. (Intern)
Number of pages: 17
Publication date: 2004

Publication information
Publisher: [s.n.]
Original language: Danish
Main Research Area: Technical/natural sciences

Bibliographical note
Rapport udarbejdet for Københavns Kommune
Source: orbit
Source-ID: 226974
Publication: Research › Report – Annual report year: 2004

Erfaringer med udsætninger af geddeyngel

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Jacobsen, L. (Intern), Berg, S. (Intern)
Pages: 16135-16138
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information
Journal: Lystfiskeri-tidende
Volume: 115
Issue number: 1117
ISSN (Print): 0904-5414
Original language: Danish
Source: orbit
Source-ID: 227426
Publication: Research › Journal article – Annual report year: 2003

Mærkning af store gedder i Stege Nor

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Jacobsen, L. (Intern), Skov, C. (Intern), Berg, S. (Intern)
Pages: 29
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information
Journal: Amatørfiskeren
Volume: 23
Issue number: 3
ISSN (Print): 0900-2650
Rating: ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Source: orbit
Source-ID: 225930
Publication: Research › Journal article – Annual report year: 2003
Post-stocking survival of 0+ year pike in ponds as a function of water transparency, habitat complexity, prey availability and size heterogeneity

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Jacobsen, L. (Intern), Berg, S. (Intern)
Pages: 311-322
Publication date: 2003
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Fish Biology
Volume: 62
Issue number: 2
ISSN (Print): 0022-1112
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.57 SJR 0.741 SNIP 0.882
Web of Science (2016): Indexed yes
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Scopus rating (2010): SJR 0.774 SNIP 0.834
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Scopus rating (2009): SJR 0.773 SNIP 0.891
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Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.827 SNIP 0.898
Udsætning af geddeyngel i Københavns indre søer 2002: Overlevelse, habitatvalg, vækst, fædevalg og afledte effekter

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Berg, S. (Intern)
Number of pages: 15
Publication date: 2003

Publication information
Place of publication: København
Publisher: BST Københavns Kommune
Original language: Danish
Source: orbit
Source-ID: 227452
Publication: Research › Report – Annual report year: 2003

A comparative study on determining fish numbers and biomass in lakes: Five methods compared with the true answer

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Publication date: 2002
Event: Poster session presented at EIFAC Symposium on Inland Fisheries Management and the Aquatic Environment, Windermere, United Kingdom.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 279397
Publication: Research › Poster – Annual report year: 2002

Activity and food choice of piscivorous perch (Perca fluviatilis) in a eutrophic shallow lake: a radio-telemetry study

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Jacobsen, L. (Intern), Berg, S. (Intern), Broberg, M. (Ekstern), Jepsen, N. (Intern), Skov, C. (Intern)
Pages: 2370-2379
Publication date: 2002
Main Research Area: Technical/natural sciences
Behaviour of piscivorous perch, investigated by radio telemetry

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Betydning af gemmeststeder, vandets klarhed og alternativt bytte for kannibalisme blandt geddeyngel

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern)
Publication date: 2002
Main Research Area: Technical/natural sciences

Publication information
Journal: www.fiskepleje.dk
Original language: Danish
Links:
http://www.dfu.min.dk/fiskepleje/Geddeyngel.htm
Source: orbit
Source-ID: 227423
Publication: Research › Journal article – Annual report year: 2002

Changes in the fish community and water quality during seven years of stocking piscivorous fish in a shallow lake

1. Piscivores (annual stocking of 1000 individuals ha(-1) of 0+ pike and a single stocking of 30 kg ha(-1) of large 20-30 cm perch) were stocked in seven consecutive years in a shallow eutrophic lake in Denmark. The stocking programme aimed at changing food-web structure by reducing zooplanktivorous and benthivorous fish, with resultant effects on lower trophic levels and ultimately water quality. 2. The fish community and water quality parameters (Secchi depth, concentrations of total phosphorus, chlorophyll a and suspended solids) were monitored between 1996 and 2000 and relationships were evaluated between predatory fish and potential prey and between zooplanktivorous or benthivorous fish and water quality parameters. In addition, potential consumption of piscivorous fishes was calculated. 3. The density of fish feeding on larger zooplankton or benthos (roach >15 cm, crucian carp >15 cm) declined distinctly during the study period. This effect was attributed to predation by large (>50 cm) pike. Based on scale readings, we cautiously suggest that the stocking of 0+ pike boosted the adult pike population to produce an unexpected impact in later years. Conversely, no direct impact of stocked 0+ pike was detected on 0+ roach. 4. A major decline in the recruitment strength of 0+ roach was observed in 2000. A combination of (i) the indirect effect of large pike preying on adult roach, with negative effect on roach reproduction and (ii) the direct predation effect of 0+ pike and or 1+ and 2+ perch recruited in the lake, provides the most likely explanation of this phenomenon. 5. A marked increase in Secchi depth in 2000 and declining trends in suspended solids, chlorophyll-a and total phosphorus concentrations were observed. These changes may also be attributable to changes in the fish community, although the relationships were not straightforward. 6. This 7-year study indicates that piscivorous fish may be a significant structuring force in shallow eutrophic lakes, suggesting that stocking piscivores can increase predation pressure on cyprinids. However, the general lack of impact of 0+ pike points to the need of refining current stocking practices in several countries across Europe

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Perrow, M. (Ekstern), Berg, S. (Intern), Skovgaard, H. (Ekstern)
Pages: 2388-2400
Publication date: 2002
Main Research Area: Technical/natural sciences

Publication information
Journal: Freshwater Biology
Volume: 47
Issue number: 12
ISSN (Print): 0046-5070
Ratings:
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
Fish sampling by the Artificial Vegetation Module (AVM) system

**General information**

State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Jacobsen, L. (Intern), Berg, S. (Intern), Jeppesen, E. (Ekstern), Søndergaard, M. (Ekstern), Lauridsen, T. (Ekstern)
Publication date: 2002
Event: Poster session presented at EIFAC Symposium on Inland Fisheries Management and the Aquatic Environment, Windermere, United Kingdom.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 227425

Publication: Research - peer-review › Journal article – Annual report year: 2002
Geddeyngel kræver vegetation

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern)
Publication date: 2002
Main Research Area: Technical/natural sciences

Geddeyngels fødevalg i Udbyover Sø

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern)
Publication date: 2002
Main Research Area: Technical/natural sciences

Gode skjulesteder øger overlevelsen af geddeyngel

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern)
Publication date: 2002
Main Research Area: Technical/natural sciences
Grønlæger og andre levesteder for geddeyngel

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern)
Publication date: 2002
Main Research Area: Technical/natural sciences

Publication information
Journal: www.fiskepleje.dk
Original language: Danish
Links:
http://www.dfu.min.dk/fiskepleje/grantraer.htm
Source: orbit
Source-ID: 227437
Publication: Research › Journal article – Annual report year: 2002

Habitat use and foraging success of 0+pike (Esox lucius L.) in experimental ponds related to prey fish, water transparency and light intensity

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Berg, S. (Intern), Jacobsen, L. (Intern), Jepsen, N. (Intern)
Pages: 65-73
Publication date: 2002
Main Research Area: Technical/natural sciences

Publication information
Journal: Ecology of Freshwater Fish
Volume: 11
Issue number: 2
ISSN (Print): 0906-6691
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.66 SJR 0.804 SNIP 0.885
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.022 SNIP 1.192 CiteScore 1.92
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.866 SNIP 0.994 CiteScore 1.58
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 0.971 SNIP 1.072 CiteScore 1.77
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.061 SNIP 1.247 CiteScore 2.05
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Kannibalisme, gedder og biomanipulation

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern)
Publication date: 2002
Main Research Area: Technical/natural sciences

Publication information
Journal: www.fiskepleje.dk
Original language: Danish
Links:
http://www.dfu.min.dk/fiskepleje/Geddeyngel.htm#kannibalisme
Source: orbit
Source-ID: 227439
Publication: Research › Journal article – Annual report year: 2002

Mærkning af geddeyngel

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern)
Publication date: 2002
Main Research Area: Technical/natural sciences

Publication information
Journal: www.fiskepleje.dk
Original language: Danish
Links:
http://www.dfu.min.dk/fiskepleje/Geddeyngel.htm#kannibalisme
Source: orbit
Source-ID: 227442
Publication: Research › Journal article – Annual report year: 2002
Management of lake fish populations and lake fisheries in Denmark: History and current status

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Jacobsen, L. (Intern), Berg, S. (Intern), Skov, C. (Intern)
Publication date: 2002
Conference: EIFAC Symposium on Inland Fisheries Management and the Aquatic Environment, Windermere, United Kingdom, 12/06/2002 - 12/06/2002
Main Research Area: Technical/natural sciences

Øresten afslører kannibalisme blandt geddeyngel

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern)
Publication date: 2002
Main Research Area: Technical/natural sciences

Stocking 0+ pike (Esox lucius L.) as a tool in the biomanipulation of shallow eutrophic lakes

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern)
Number of pages: 205
Publication date: 2002
Publication information
Publisher: University of Copenhagen
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 227450
Publication: Research › Ph.D. thesis – Annual report year: 2002
Udsætning af geddeyngel som redskab i restaurering af uklare søer

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Berg, S. (Intern), Jacobsen, L. (Intern), Bjørnsen, P. (Ekstern)
Pages: 47-48
Publication date: 2002

Host publication information
Title of host publication: Natur- og Miljøforskningskonference
Editors: Frich, P., Johnsen, P.
Main Research Area: Technical/natural sciences
Conference: Copenhagen, Denmark, 22/08/2002 - 22/08/2002
Source: orbit
Source-ID: 237651
Publication: Research › Article in proceedings – Annual report year: 2002

Udsætningstidspunkt og kannibalisme blandt geddeyngel

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern)
Publication date: 2002
Main Research Area: Technical/natural sciences

Publication information
Journal: /www.fiskepleje.dk
Original language: Danish
Links:
http://www.dfu.min.dk/fiskepleje/Geddeyngel.htm
Source: orbit
Source-ID: 227455
Publication: Research › Journal article – Annual report year: 2002

Behavior of pike (Esox lucius L.) >50 cm in a turbid reservoir and in a clearwater lake

General information
State: Published
Organisations: National Institute of Aquatic Resources, Section for Freshwater Fisheries Ecology
Authors: Jepsen, N. (Intern), Beck, S. (Ekstern), Skov, C. (Intern), Koed, A. (Intern)
Pages: 26-34
Publication date: 2001
Main Research Area: Technical/natural sciences

Publication information
Journal: Ecology of Freshwater Fish
Volume: 10
Issue number: 1
ISSN (Print): 0906-6691
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.66 SJR 0.804 SNIP 0.885
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.022 SNIP 1.192 CiteScore 1.92
Laboratory experiments demonstrated that both alizarin complexone and strontium are useful in mass marking of pike Esox lucius fry otoliths. Visual detection of alizarin complexone marks was considered more reliable than the quantitative analysis of strontium for differentiating marked and unmarked individuals after release in a Danish lake. (C) 2001 The Fisheries Society of the British Isles.
Artificial Vegetation Module (AVM) system; A new technique for fish sampling and experimental designing

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Jacobsen, L. (Intern), Berg, S. (Intern), Jeppesen, E. (Ekstern), Søndergaard, M. (Ekstern), Lauridsen, T. (Ekstern)
Publication date: 2000
Event: Poster session presented at ASLO 2000 Aquatic Science Meeting, Research Across Boundaries, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 279400
Publication: Research › Poster – Annual report year: 2000

Effect of piscivorous fish on stickleback behaviour in a eutrophic brackish lake

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Berg, S. (Intern), Jacobsen, L. (Intern), Skov, C. (Intern)
Publication date: 2000
Event: Poster session presented at ASLO 2000 Aquatic Science Meeting, Research Across Boundaries, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Source: orbit
Source-ID: 279401
Publication: Research › Poster – Annual report year: 2000

Fiskeplejens forskning i søer gennem 12 år

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Berg, S. (Intern), Skov, C. (Intern), Jacobsen, L. (Intern)
Pages: 46-53
Publication date: 2000
Main Research Area: Technical/natural sciences

Publication information
Journal: Fisk og Hav
Issue number: 51
ISSN (Print): 0105-9211
Ratings:
ISI indexed (2013): ISI indexed no
ISI indexed (2012): ISI indexed no
ISI indexed (2011): ISI indexed no
Original language: Danish
Links:
Source: orbit
Source-ID: 224907
Publication: Research › Journal article – Annual report year: 2000
Movements of large perch (Perca fluviatilis) in a shallow lake, investigated by radio telemetry

**General information**

State: Published  
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources  
Authors: Jacobsen, L. (Intern), Berg, S. (Intern), Skov, C. (Intern)  
Publication date: 2000  
Event: Poster session presented at International Symposium and Workshop on Management and Ecology of Lake and Reservoir Fisheries, Hull, United Kingdom.  
Main Research Area: Technical/natural sciences  
Source: orbit  
Source-ID: 279399  
Publication: Research › Poster – Annual report year: 2000

Six years of stocking with piscivores in a shallow eutrophic lake: Changes in fish population and lake environment

**General information**

State: Published  
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources  
Authors: Skov, C. (Intern), Berg, S. (Intern), Jacobsen, L. (Intern)  
Publication date: 2000  
Main Research Area: Technical/natural sciences  
Source: orbit  
Source-ID: 279390  
Publication: Research › Conference abstract for conference – Annual report year: 2000

Naturlige og kunstige levesteder for geddeyngel

**General information**

State: Published  
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources  
Authors: Skov, C. (Intern), Berg, S. (Intern)  
Pages: 96-98  
Publication date: 1999  
Main Research Area: Technical/natural sciences

**Publication information**

Journal: Vand & Jord  
Volume: 6  
Issue number: 3  
ISSN (Print): 0908-7761  
Ratings:  
ISI indexed (2013): ISI indexed no  
ISI indexed (2012): ISI indexed no  
ISI indexed (2011): ISI indexed no  
Original language: Danish  
Source: orbit  
Source-ID: 227446  
Publication: Research › Journal article – Annual report year: 1999

Utilization of natural and artificial habitats by YOY pike in a biomanipulated lake

**General information**

State: Published  
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources  
Authors: Skov, C. (Intern), Berg, S. (Intern)  
Pages: 115-122  
Publication date: 1999  
Main Research Area: Technical/natural sciences
Gedder grantræer og gemmesteder

General information
State: Published
Organisations: Section for Freshwater Fisheries Ecology, National Institute of Aquatic Resources
Authors: Skov, C. (Intern), Berg, S. (Intern)
Pages: 259-263
Publication date: 1998
Main Research Area: Technical/natural sciences

Publication information
Journal: Ferskvandsfiskeribladet
Anglers Mobile App: A mutual service platform between research and citizens (39122)
Recreational fishing is an extremely popular pastime in Denmark, with as many as 400,000–500,000 regularly engaging in the activity. In order to secure that fish are available for the anglers and at the same time understand how fish stocks interact with biotic and abiotic factors, knowledge about the fish stocks in Danish lakes, rivers and coastal areas is crucial. However, data gathering on national scale, and at regular intervals is expensive and logistically prohibitive. This lack of data limits scientific understanding as well as sustainable management. Consequently, DTU Aqua has developed an electronic platform where anglers can report their catch in a standardized way for their own pleasure as well as for the benefits of angler clubs and national research on fisheries management. The "Fangstjournalen" platform consists of a browser version as well as a native mobile app (Iphone and Android). The platform allow anglers to record the details of their fishing trips and catches, but is also used as a vehicle for gaining human dimension information, i.e information about angler distribution as well as aspects of angler motivation and satisfaction.

Angler apps for mobile devices are not new, but the existing market (e.g. FishBrains ; iAngler ; iFish App ) focus on aspects such as "socializing" "curiosity" and "entertainment" more that on gathering the minimum necessary data for use for research, and centralizing it to underpin stock management. The angler app developed by DTU Aqua has several novelty aspects and integrates both catch statistics and human dimension aspects. During the two years it has taken to
develop the platform there has a strong focus on optimizing the scientific value of the data that is sampled, and at the same time recognizing opportunities as well challenges associated with angler mobile apps as a source of recreational fisheries data. For example, catch efficiency of anglers depend on human dimension factors such as skills, gear and experience. The angler should provide this information during registration so researchers can calibrate data. Likewise, in case of blank fishing trips with “no catch”, the anglers should also report to strengthen data quality. To secure such compliance from the anglers, we focus on strong and clear communication from researcher to angler.

The platform was released for the public at the end of 2015, so the outcome of this citizen science project is still in its infancy and uncertain. However the omnipresence and wide use of mobile internet devices offers a unique opportunity to use a citizen science approach to bridge the gap between the lack of knowledge, research and impact of recreational fishermen in a mutually beneficial way. In that perspective DTU Aqua are first movers. Moreover, in time, the platform has the potential to instill responsible stewardship among recreational fishermen i.e. to engage and educate as much as 5% of Denmark’s population on a regular basis.

This project is coordinated by DTU Aqua.

The project is funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Dalsgaard Data A/S
Period: 01/01/2015 → …
Number of participants: 2
Research area: Freshwater Fisheries and Ecology
Project participant:
Skov, Christian (Intern)
Grigorov, Ivo (Intern)

**Evaluations of tagging effects (39124)**

Much of the science-based management of fish and fisheries are based on results from various electronic tagging methods be it radio-, acoustic-, Data Storage- or PIT tags. This project aims to investigate and document possible effects of commonly used tagging methods and improve these methods to ensure that results from tagging studies are representative and unbiased. Hand in hand with this goes animal welfare issues, where we try to reduce the impact on each fish as well as refine the methods used for capture, handling and tagging, according to the 3R’s. In field-based research post-treatment evaluations are difficult and thus rare, however needed. Within this project we will focus on evaluation of sub-lethal effects of surgical implantation, identify size thresholds for PIT-tagging small fish and testing new suture materials.

The project is coordinated by DTU Aqua.

The project is funded by Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Period: 01/01/2014 → 31/12/2016
Number of participants: 2
Research area: Freshwater Fisheries and Ecology
Project participant:
Skov, Christian (Intern)
Project Manager, academic:
Jepsen, Niels (Intern)

**Behaviour and feeding biology of lacustrine fish species in relation to lake type**

National Institute of Aquatic Resources
Period: 01/03/2013 → 30/01/2018
Number of participants: 6
Phd Student:
Holst Hansen, Joan (Intern)
Supervisor:
Handbook for management of lake fish and fisheries (38826 & 39169)
This project has developed a web-based handbook in lake fisheries management. The end goal was to provide local anglers and lake managers (which are often not biologists) with knowledge about the biology of focal species as well as a tool box on how to manage these with regards to both environment and fisheries. A central part of the handbook focus on compiling thorough descriptions of species and their ecology, environmental requirements, etc. based on existing knowledge from our own research and the literature. Focus is also on a description of different measures that can be used to protect or enhance abundance of specific fish species. The handbook incorporates existing legislation on freshwater fisheries and management as well as a description of angling techniques. In addition we give advice on how anglers specifically and citizens in general can participate in the process, i.e. by practical help or cooperation with the municipalities or other authorities that may be responsible for the lake management.

The handbook covers all types of lake fishery preferences (species, sizes, quantity, etc.), with due consideration to authenticity and environmental conditions. All pages include FAQ's to answer the most common inquiries, as well as email addresses of the authors of the text which facilitates that users of the handbook easily can interact with the researchers.

The lake handbook was published online in 2013 as an integrated part of the existing homepage www.fiskepleje.dk. It is continuously updated when new knowledge is available, always providing latest knowledge on fisheries management to a broad audience of users.

Lake ecology and fish population dynamics is complex and often very lake specific. Unfortunately knowledge on the environment and fish populations of specific lakes is often scarce or lacking, making fisheries management difficult. A part of the project has focused on how to use citizen science to increase our knowledge. Hence, we explore the use of anglers log book as a method to get knowledge on fish populations and we initiated a nation-wide anglers log book for pc and cellphones (which in 2013 became an independent project expanding from lakes to cover all freshwater and marine habitats). The project also explores the use of citizens reporting on environmental parameters in lakes. We have by now recruited a corpse of citizens ('Water Environment Agents') who measure Secchi depths and presence of the invasive zebra mussel in various lakes on a regular basis. We continue recruitment of citizens for this purpose.

Another part of the project has been aimed at establishing a web-based platform, named The Knowledge Base, where
citizens and authorities can find knowledge about specific lakes. The cornerstone is a web-library, where close to 1000 reports on lake environment or fish covering the last ca. 75 years can be found in pdf-format. Some reports has never been published before, others has been very hard to find (only paper-versions in The National Library). A large collection (1000+) of historic (1915-1960) photos of Danish lakes and rivers taken by former employees of the department (C. V. Otterstrøm and Knud Larsen) has been digitalized and will be available online in fall 2016. The primary search method is via a GIS-based map. This will be supplemented with a more traditional database search option fall 2016.

The project is coordinated by DTU Aqua.

The project is funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Danish Anglers Association
Freshwater Fisheries Association

The Fishing Trust
Period: 01/01/2011 → 31/12/2016
Number of participants: 6
Research area: Freshwater Fisheries and Ecology
Project participant:
Sivebæk, Finn (Intern)
Therkildsen, Birgit (Intern)
Project Manager, academic:
Jacobsen, Lene (Intern)
Skov, Christian (Intern)
Berg, Søren (Intern)
Nielsen, Jan (Intern)

Inter- and intralake behaviour and migration of fish (38266)

This project supports the research area fishmigration. In many shallow lakes cyprinid fishes like roach (Rutilus rutilus)and bream (Abramis brama) aggregate in inlet- and outlet streams during winter. Up to 85 % the bream and roach may leave the lake and individuals may stay out of the lake for periods up to 7 months during winter. However there is interannual variation in the part of the population that participates in this so called partial migration. Since 2005 DTU Aqua has investigated patterns of seasonal migrations of cyprinids in three Danish lakes and thereby, in combination with international collaborators, furthered our knowledge on the behavior of some of the most common fish species in Denmark. This has resulted in numerous publications/reviews about partial migration. By expanding the investigation period to include 2011-2016 we have increases the length of the time series leading to a better understanding of the annual variation in migration patterns. In addition we included the effects of seasonal premigration on top predator fitness in the study. Top predators such as pike (E. lucius) are important species in recreational fisheries, and in order to optimize fisheries management it is crucial to understand the biology of these predators. Since the migrating cyprinids are important prey for the pike and since previous results have shown that pike do not follow the prey into the stream, the migration of cyprinids are likely to affect seasonal patterns of predator fitness. Overall, this project increases our knowledge on fish behavior and fish population dynamics in lakes and thereby expands our tool box for management of lacustrine fishes.

During the project period focus has been on three areas (the last two as part of a PhD project with deadline in 2017):

Mechanisms behind partial migration

The risk of predation from birds and fish as well as the distribution of feeding resources are two very likely explanatory components in spatial ecology of fish in general and partial migration in specific. DTU Aqua have published several studies and reviews focusing on these as well as other mechanisms involved in partial migration such as body morphology, sex, individual variations in boldness and temperature.

The influence of cyprinid partial migration on top-predator pike feeding dynamics

Pike feeding patterns and prey availability in number of open and closed lakes are monitored from early fall to late spring. This could reveal that pike in open lakes where prey abundance fluctuate during season require more management attention i.e. due to restricted growth and/or increased cannibalism in periods with low prey abundance.

Migration between neighboring lakes

Two of the three focal lakes in which we are monitoring seasonal migrations are situated only 3 km apart and connected by a small stream. So far it has become obvious that from time to time large amounts of fish move from one lake to another. By continuing to pit tag and monitor fish migration we are likely to observe more of these mass migration events, which in turn facilitate a better understanding of why and when these mass migrations occur. Clearly, the level of fish exchange between neighboring lakes is an important factor to consider when it comes to management of lakes.

The project is coordinated by DTU Aqua.

The project is funded by the Danish Rod and Net Fishing License Funds.
Predation from birds and mammals and the significance for populations of freshwater fish (38829)

It is a well-known fact that predation can be a key factor for many fish populations and in some areas predation may even be the most important regulating factor for fish stocks of major recreational importance. Several species of predators were earlier persecuted, but are now protected and have experienced high population growths recently. This includes species like: cormorant, grey heron, seals and otter. Thus, the protection of these species has been a conservation success, but has also caused severe conflicts between various user-groups. To handle and mitigate these conflicts, scientific documentation is severely needed.

During a long period, DTU Aqua has carried out a number of projects that directly or as side-results have assessed the magnitude of predation and its impact on various fish stocks. This has provided some insight in when, where and by whom the important recreational fish species are being eaten. This project gathered and synthesized this knowledge to provide an overview of the significance of predation.

Outputs:
- Synthesis and analyses of existing knowledge/results.
- Method evaluation for scanning for PIT tags in cormorant/heron colonies.
- Investigations of possible causes for the recent drastic decline in grayling (Thymallus thymallus) populations.

The project was funded by the Danish Rod and Net Fishing License Funds.
The present project aims to initiate investigations of the dependence of perch for access to freshwater lakes and bogs for spawning. In particular it will be explored if it is possible to enhance brackish water perch recruitment by creating or reopening of access to lakes and bogs along a river system and this way to be able to re-establish or increase the brackish water perch fishery. This is highly relevant to local authorities that manage restoration of rivers and lakes. For this purpose the perch population of a large number of lakes and bogs along river systems with present or historical migration of brackish water perch will be monitored. Some of the lakes have connection to the river, some not, and in the latter a connection will be created afterwards. The fish population and recruitment of perch will be studied before and after the intervention. Scale chemistry will be explored and possibly this will be able to define whether large perch caught in the lakes and bogs during spawning actually had a brackish water life history. The project also aims to elucidate the salinity tolerance of perch under Danish condition to establish whether it is possible that some perch spawn along the coast and bays of southern Denmark. The project is done in close cooperation with municipalities around southern Zealand.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Aalborg University
Municipality of Næstved
Municipality of Vordingborg
Municipality of Guldborgsund
University of Copenhagen
Period: 01/01/2010 → 31/12/2016
Number of participants: 4
Research area: Freshwater Fisheries and Ecology
Project participant:
Berg, Søren (Intern)
Skov, Christian (Intern)
Aarestrup, Kim (Intern)
Project Manager, academic:
Jacobsen, Lene (Intern)

The molecular basis of local adaptation in brown trout

National Institute of Aquatic Resources
Period: 01/02/2009 → 25/04/2012
Number of participants: 8
Phd Student:
Meier, Kristian (Intern)
Supervisor:
Als, Thomas Damm (Intern)
Hansen, Michael Møller (Intern)
Skov, Christian (Intern)
Main Supervisor:
Bekkevold, Dorte (Intern)
Examiner:
Eg Nielsen, Einar (Intern)
Allendorf, Fred W. (Ekstern)
Knutsen, Halvor (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Institut stipendie (DTU) Samf.
Project: PhD

Scaling of Individual trout behaviour and life history to population dynamics

National Institute of Aquatic Resources
Behaviour of lake-dwelling fish
National Institute of Aquatic Resources
Period: 01/12/2008 → 19/09/2012
Number of participants: 10
Phd Student:
Baktoft, Henrik (Intern)
Supervisor:
Aarestrup, Kim (Intern)
Berg, Søren (Intern)
Koed, Anders (Intern)
Skov, Christian (Intern)
Svendsen, Jon Christian (Intern)
Main Supervisor:
Jacobsen, Lene (Intern)
Examiner:
Rasmussen, Gorm (Intern)
Cooke, Steven J. (Ekstern)
Lucas, Martyn Charles (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: 1/3 FUU, 1/3 inst 1/3 Andet
Project: PhD

Behaviour of lake-dwelling fish: natural and fishery induced impacts (38270)
The project focuses on establishing new and comprehensive knowledge on behavior of lake dwelling fish and the impact of human activities, which can eventually enhance management of freshwater fish populations. The study is based on an acoustic telemetry system, which facilitates fine scale 3D positioning of fish several times a minute with sub meter accuracy. The system has been deployed in a small lake for five consecutive years and has generated data sets on pike, perch and roach behavior with unprecedented details, e.g. activity levels and habitat choice on a diel and seasonal basis coupled to environmental factors such as establishment and break of thermoclines. For instance, studies on pike winter behavior during ice cover have generated new insights and added to the increased consciousness of the importance of year-round knowledge on lake ecology processes. The remote sensed monitoring of the tagged fish without presence of personnel has allowed for comparison of fish behavior in situations with and without human disturbances, e.g. fishery-related activities. This way a distinct and instantaneous impact of boating on fish behavior has been revealed and the impact of catch and release angling has been addressed. Finally, the system has facilitated studies extending laboratory findings to behavior in the field. For instance, findings of physiological (metabolic rates) and behavioral properties of individual fish in the lab have been linked with behavior of the same individuals in nature by subsequent tagging and release in the lake.

Several issues have been studied concurrently the last years and will be continued: A principal focus area has been striving to establish which factors impact and confine natural pike populations. The majority of larger pike in the study lake
have been followed for more than three years, which has provided a detailed picture of pike behavior and individual variation. The interactions between pike size groups and whether the behavior of smaller pike is controlled by larger individuals has been studied and has revealed differences in both activity patterns and habitat choice ruled by the largest pike, as well as uncovered extensive cannibalism among large individuals. Pike exploitation of various spawning habitats has been assessed and a genetic analysis of pike individuals and pike eggs will be explored, possibly facilitating assessment of the individual contribution to the population and thus enabling a cross-discipline approach to explore how behavior and reproductive fitness is related.

The studies on winter biology are not only covering pike, but are incorporating the entire fish community adding further insights to the limited overall knowledge on winter lake ecology. Further, while simultaneous tracking several species the system allows for studies of predator-prey and species interactions, shoaling etc. in a natural system.

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Fisheries and Oceans Canada
Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), Berlin
Period: 01/01/2008 → 31/12/2016
Number of participants: 4
Research area: Freshwater Fisheries and Ecology

Predator fish populations: The impact of behavioural and physical-biological parameters (38267)
Some of the mechanisms guiding the interactions of fish species in clear water lakes seems to act differently in turbid water, thus more knowledge of these relationships are essential. Both in order to understand how the fish population in a lake will develop when the lake is about to change to a clear water state, but also in order to understand the stability of predator fish populations under various environmental conditions. One of the important related issues can be the capability of predator fish, to hunt in turbid water and the interactions of more predator fish species. The capacity of pike and large perch to hunt in turbid water was tested in extensive pond experiments with different clay turbidity, including also the importance of prey fish density. The experimental approach was supplemented by parallel radio telemetry field studies of both predator species, in order to explain the role of behaviour and the importance for the natural composition of fish populations in turbid and clear water lakes. Pond experiments showed that pike were perfectly able to hunt in turbid water, backed up by the field findings of higher activity levels for some pike in the turbid lake, however in general with a larger variation in behavioural strategy in turbid water. Surprisingly, perch were also capable of hunting in very low turbidity at least in high prey fish densities. The telemetry study showed two alternative behavioural patterns of perch in clear water and turbid water, perch being more active in the turbid water on a diel basis including at night and not showing any sunrise and sunset peaks in activity as was seen in the clear water lake. The alternative strategy in the turbid lake might be interpreted as a means of allocating more time for hunting due to visual constraints. Contemporary studies on prey fish behaviour in the study lakes also revealed different behaviours on a diel basis dependent on turbidity, which can be linked to predator fish behaviour.

Two peer-reviewed papers and a master thesis were published on pike-behaviour as well as two peer-reviewed papers on perch behaviour. Results were presented on international and national conferences.

The project was coordinated by DTU Aqua.

The project was funded by the Danish Rod and Net Fishing License Funds.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Lund University
Period: 01/01/2005 → 30/06/2016
Number of participants: 5
Research area: Freshwater Fisheries and Ecology

Project participant:
Management of the fish population in lakes under heavy human influence (38268)

The objectives of this project are to improve our understanding of how the physical conditions of lakes can affect spawning and fry mortality and growth for the most important piscivorous fish species. We will especially focus on the conditions of the littoral zone. This knowledge can be used to insure that the demands of these species in relation to spawning and YOY development are met. The results will be used as part of the web-based "Handbook on the Management of Lake Fish", which is under development.

The majority of Danish lakes are strongly influenced by human activity, partly in the form of increased nutrient load, but also direct physical alterations are common, e.g. by regulation of the water level, consolidation of the banks or the consequences of heavy boat traffic. These types of physical alterations are often most common in lakes situated in or close to urban areas. In these kinds of lakes, lake restoration by biomanipulation might prove to be insufficient to achieve the improved environmental conditions expected, including a good population of piscivorous fish. Thus, the lakes environmental quality, as well as the possibility to use the lake for recreational activities including recreational fisheries, might be negatively influenced.

During the project, several activities related to this subject have been conducted:
1) An experiment demonstrating the importance of water depth for the mortality of 0+ pike.
2) Another experiment, which showed that it is possible to build an artificial spawning habitat for pike in an urban, artificial lake without a natural littoral zone and that the pike did use it for spawning and that the pike fry used it as nursery habitat.
3) A stocking experiment with 0+ pike to find out if stocking is a possible way to enhance a very low population density of pike in a lake with heavy boat traffic and extensive angling. During this experiment we demonstrated that it is possible to tag 0+ pike of 6-8 cm with PIT tags without mortality, but also that the tagging has a negative effect on growth of the tagged pike.
4) An investigation on the spawning habitat choice and spawning behavior of pike in a small natural lake (in cooperation with project no 39270).

The use of specially designed "egg traps" has been used successful in two of these experiments.

The project is coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
City Council of Copenhagen
Period: 01/01/2003 → 31/03/2013
Number of participants: 3
Research area: Freshwater Fisheries and Ecology
Project participant:
Baktoft, Henrik (Intern)
Project Manager, academic:
Berg, Søren (Intern)
Skov, Christian (Intern)

The development of the fish community in lakes after biomanipulation: key factors in the development of a good population of piscivorous fish species (38264)

The objectives of the project are to strengthen the ability of DTU Aqua to consult authorities and stakeholders in the management of the fish community in lakes through (i) building time series on the development of the fish population in lakes, which has been subject to biomanipulation, (ii) make a cross analysis on a large data set containing information on standardized investigations of the fish community in more than 100 Danish lakes. Target species in lake fisheries in Denmark are the piscivorous species, which will be the focus of this project as well.

1) Biomanipulation has been applied to more than 50 Danish lakes with the objective to restore eutrophicated lakes to a state with clear water, extensive distribution of submerged macrophytes, a higher degree of biodiversity compared to turbid lakes, and a fish community dominated by piscivorous fish species. It is possible to apply biomanipulation to almost any eutrophic lake, but this restoration tool will only have a long lasting effect in lakes with an intermediate or low content
and load of nutrients. In lakes where the improved environmental conditions last for several years, changes in the fish community can still be observed many years after the biomanipulation. Thus we want to describe the long term (10-25 years) development of the fish community, to be able to correctly answer what the end product of a biomanipulation is, regarding fish, on both community structure and population dynamics of the piscivorous species.

Beginning in 1990 we have built time series of the development on the fish population in 10 Danish lakes, where biomanipulation has been applied as a restoration tool. We use a standardized investigation method, which allows both within and between lakes analysis. Under the project 38826 (Handbook for management of lake fish and fisheries) a status report will be prepared in fall 2011.

2) The cross analysis of the more than 100 lake data set aims at developing models to describe the relation between population density and size distribution for important piscivorous species and factors like food availability, distribution and types of vegetation, nutrient levels and water clarity. This analysis is also done within the frame of the project 38826 (Handbook for management of lake fish and fisheries).

National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Period: 01/01/1999 → 31/12/2011
Number of participants: 2
Research area: Freshwater Fisheries and Ecology
Project Manager, academic:
Berg, Søren (Intern)
Skov, Christian (Intern)

Activities:

ICES - Working Group on Recreational Fisheries Surveys - WGRFS (External organisation)
Period: 2015
Christian Skov (Participant)
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Degree of recognition: International

Related external organisation
ICES - The Working Group on Recreational Fisheries Surveys - WGRFS
Activity: Membership › Membership of committees, commissions, boards, councils, associations, organisations, or similar

ICES - The Working Group on Recreational Fisheries Surveys - WGRFS (External organisation)
Period: 2014
Christian Skov (Participant)
National Institute of Aquatic Resources
Section for Freshwater Fisheries Ecology
Degree of recognition: International

Related external organisation
ICES - The Working Group on Recreational Fisheries Surveys - WGRFS