**Modification of essential fatty acid composition in broodstock of cultured European eel Anguilla anguill L.**

Farmed eels had lower levels of arachidonic acid (20:4 n-6) (ARA) and higher ratios of eicosapentaenoic acid (20:5 n-3) (EPA):ARA compared to wild European eel sampled from the Baltic Sea and southern Norwegian coast. Eels fed a formulated feed (JD) with a distribution of essential fatty acids (EFA) resembling wild European eel were sampled after 0, 5, 10, 14 and 44 weeks of feeding to examine changes in fatty acid composition (FAC) in ovaries, visceral fat and muscle. The results showed a slow but steady incorporation of EFA. Lipids are incorporated in the oocytes early in oogenesis, and the leading cohort of oocytes is rich in lipid droplets before the onset of vitellogenesis. This indicates that feeding with optimized broodstock feeds should start early to allow the incorporation of EFA in the first cohort of oocytes. At least 14 weeks of feeding is required to change lipid EFA in broodstock eel to resemble EFA in the diet or in wild fish. After 44 weeks of feeding, ARA was significantly higher in the neutral lipids of ovaries (1.9%) compared to visceral fat (1.2%) or muscle (1.0%). EPA:ARA ratios decreased two- to threefold in all tissues examined during that time. ARA and docosahexaenoic acid (22:6 n-3) (DHA) had accumulated in ovarian polar lipids.
Havet - en uudnyttet ressource: En vidensyntese om danske muligheder indenfor marin bioteknologi og anden udnyttelse af havets ressourcer

General information
State: Published
Organisations: Division of Seafood Research, National Food Institute
Authors: Børresen, T. (Intern), Jarlbæk, H. (Intern)
Number of pages: 84
Publication date: 2010

Publication information
Place of publication: København
Publisher: Ministeriet for Fødevarer, Landbrug og Fiskeri
ISBN (Print): 978-87-7083-777-4
ISBN (Electronic): 978-87-7083-778-1
Growth of juvenile Atlantic cod Gadus morhua in land-based recirculation systems: Effects of feeding regime, photoperiod and diet

The combined effect of feeding regime and photoperiod on the growth of juvenile Atlantic cod Gadus morhua in land-based recirculating aquaculture systems (RAS) was examined using three different commercial diets. Fish of 8–10 g were reared in 1 m³ tanks at an initial density of 10 kg m⁻³ for 78 d. Three RAS units were used to simultaneously test three feed/photoperiod regimes that might be encountered in the wild or aquaculture; LightDark (LD) 24:0, LD12:11 (+ 1 h crepuscular periods) and LD6:6 (+ 12 h crepuscular periods). Feed was administered during the light period every 30 min for a 3 min feeding duration. In each RAS unit three diets (A, B and C) were tested, which were broadly similar in composition but from different manufacturers. Water exchange rate averaged 10–19% in the three recirculation systems, and key water quality parameters such as NH₄⁺ and CO₂ remained at low effect concentrations (<0.4 and <3 mg L⁻¹, respectively). Final stocking densities were 45–60 kg m⁻³. There was a significant influence of both feed/photoperiod regime and diet on specific growth rate (SGR). Fish receiving the LD12:11 and LD6:6 regimes and Diet A grew best (SGR 2.59 and 2.54% d⁻¹ respectively). Fish fed Diet B and C also grew best under the LD12:11 and LD6:6 feed/photoperiod regimes (SGR range of 2.41–2.46% d⁻¹). Conversely, fish kept in the LD24:0 feed/photoperiod regime grew relatively slowly irrespective of diet type (SGR range of 2.26–2.32% d⁻¹). The feed conversion performance of the feed/photoperiod regimes and diets followed the same pattern.
Feeding regime, Growth, Feed conversion, Photoperiod, Recirculation system, Diet

Original language: English

SeafoodCircle – A virtual centre for dialogue between science and industry
General information
State: Published
Organisations: Section for Aquatic Process and Product Technology, National Institute of Aquatic Resources, Institute Management
Authors: Østerberg, C. (Intern), Jarlbæk, H. (Intern), Børresen, T. (Intern)
Publication date: 2009
Event: Poster session presented at 3rd Joint Trans-Atlantic Fisheries Technology Conference, Copenhagen, Denmark.
Main Research Area: Technical/natural sciences
Electronic versions:
TAFT-poster - SeafoodCircle (final).pdf
Source: orbit
Source-ID: 252920
Publication: Research › Poster – Annual report year: 2009

SPICOSA og integreret udvikling af forvaltningsscenarier i kystzonen: Eutrofiering og muslingeproduktion i Limfjorden

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources
Number of pages: 42
Publication date: 2009

Host publication information
Title of host publication: 15th Danish Marine Sciences Meeting
Main Research Area: Technical/natural sciences
Conference: The 15th Danish Marine Sciences Meeting : Program og abstracts, Helsingør, 01/01/2009
Source: orbit
Source-ID: 251131
Publication: Research › Conference abstract in proceedings – Annual report year: 2009

Kunstig reproduktion af ål: Roe II og IIB

General information
State: Published
Organisations: Section for Population- and Ecosystem Dynamics, National Institute of Aquatic Resources, FF secretariat
Authors: Tomkiewicz, J. (Intern), Jarlbæk, H. (Intern)
Number of pages: 79
Publication date: 2008

Publication information
Publisher: Institut for Akvatiske Ressourcer, Danmarks Tekniske Universitet
ISBN (Print): 87-74-81066-7
Original language: Danish

Series: DTU Aqua-rapport
Number: 180-08
Main Research Area: Technical/natural sciences
Electronic versions:
180-08_elektronisk_samlet.pdf
Links:
http://www.aqua.dtu.dk/Publikationer/Forskningsrapporter/Forskningsrapporter_siden_2008
Source: orbit
Source-ID: 227692
Publication: Research › Report – Annual report year: 2008

SPICOSA Design Step, SSA 5 Limfjorden, Denmark – progress and results

General information
State: Published
Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Shellfish, Section for Management Systems, Danish Shellfish Centre

Publication date: 2008

Event: Poster session presented at SPICOSA SAF Meeting, Faro, Portugal, .

Main Research Area: Technical/natural sciences

Source: orbit

Source-ID: 251183

Publication: Research › Poster – Annual report year: 2008

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**SPICOSA Formulation Step, SSA 5 Limfjorden, Denmark – progress and results**

**General information**

State: Published

Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Danish Shellfish Centre


Publication date: 2008

Event: Poster session presented at SPICOSA SAF Meeting, Brest, France, .

Main Research Area: Technical/natural sciences

Source: orbit

Source-ID: 251182

Publication: Research › Poster – Annual report year: 2008

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**SPICOSA System Design report: SSA 5 - Limfjorden, Denmark**

**General information**

State: Published

Organisations: Section for Coastal Ecology, National Institute of Aquatic Resources, Section for Management Systems, Division of Seafood Research, National Food Institute, Danish Shellfish Centre


Number of pages: 26

Publication date: 2008

**Publication information**

Original language: English

Series: SPICOSA

Main Research Area: Technical/natural sciences

Source: orbit

Source-ID: 259941

Publication: Research › Report – Annual report year: 2008

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**Successful production of European eel larvae**

**General information**

State: Published

Organisations: Section for Population- and Ecosystem Dynamics, National Institute of Aquatic Resources, Section for Coastal Ecology, Section for Ocean Ecology and Climate, Research Secretariat, Section for Aquatic Lipids and Oxidation

Authors: Tomkiewicz, J. (Intern), Støttrup, J. (Intern), Munk, P. (Intern), Lauesen, P. (Intern), Graver, C. (Intern), Jarlbæk, H. (Intern), Jacobsen, C. (Intern), McEvoy, F. (Ekstern), Svalastoga, E. (Ekstern)

Publication date: 2007


Main Research Area: Technical/natural sciences

**Bibliographical note**

Abstract and oral presentation ved European Aquaculture Symposium, Istanbul, October, 2007

Source: orbit

Source-ID: 232873

Publication: Research › Conference abstract for conference – Annual report year: 2007
Artificial reproduction of eels: Phase III (ROE III) (38187)

The steady decline of the European eel stock has adverse consequences for the Danish eel aquaculture as all eel farming is at present capture based relying on wild caught glass eels. In 2005, DTU Aqua, University of Copenhagen and the eel aquaculture industry started to build up a research and technology platform for the development of methods to reproduce European eel in aquaculture.

The focus of ROE III was to follow up the pioneering work on artificial reproduction of European eels performed in the preceding pilot projects ROE I and II. The projects ROE II and III were a collaboration among DTU Aqua, University of Copenhagen and the eel aquaculture industry following up an initial survey ROE I of suited methodology lead by University of Copenhagen.

ROE III comprised the following activities:
(i) Experimental series with different treatment schemes and hormone dosage to improve the maturation process and optimize gamete quality;
(ii) Development of methods to monitor the maturation process on individual level using ultrasound scanning technology and ovary biopsy;
(iii) Analysis of broodstock fishes and improvement of the dietary fatty acid composition;
(iv) Investigation of parameters determining egg quality during incubation;
(v) First-feeding trials with eel larvae testing both artificial and live feed.

Three experimental series were completed focusing on methods for broodstock enhancement, maturation and fertilization plus culture of eggs and larvae. Already during the first experimental series, larvae accomplishing the entire yolk sac stage were achieved for the first in history for European eel. The yolk sac larvae developed successfully during the period where they entirely depend on nutrition sources i.e yolk and lipid of maternal origin. The larvae were ready to start feeding day 12 post hatch. During the second experimental series, larval longevity was extended to 18 days during first feeding experiments. These recent results are a major breakthrough because they show for the first time that artificial hormone treatment can lead to viable offspring in European eel. Eggs and yolk sac larvae were obtained from different hormonal treatments and mass hatchings were regularly obtained. Larval feeding using live and artificial larval feeds developed in collaboration with the food company BioMar were developed towards the end of the experiments and are ready for testing in new and coming projects.

The success of this project on improved methods, quality criteria and larval survival has led to form the basis of the project: Reproduction of European eel in aquaculture: Consolidation and new production methods and later (REEL) (38398) and later the EU FP project: Reproduction of European eel in Aquaculture: Towards a self-sustained aquaculture (PRO-EEL) (38793).

The project was coordinated by DTU Aqua.

National Institute of Aquatic Resources
Section for Marine Ecology and Oceanography
University of Copenhagen

Bioneer A/S
Danish Eel Farmers Association
Billund Aquaculture Service Aps
Period: 01/01/2007 → 31/12/2009
Number of participants: 9
Research areas: Marine Populations and Ecosystem Dynamics & Fish Biology

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Press / Media