Lipid tolerance of Atlantic cod

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Abstract
Cod of two size groups (initial weight 120 grams and 600 grams) were fed, in triplicate, for 12 weeks diets containing 10.0%, 13.5%, 21.2%, 24.5% and 27.7% lipid in dry matter. Dietary lipid did not affect growth (SGR), condition factor (CF), fillet yield, lipid content in liver or lipid content in fillet. In the smaller fish, FCR was reduced with increased diet lipid. The Heposomatic index (HSI) in the 600 grams fish was not affected by the lipid content of the diet but dietary lipid content significantly affected the HSI in the smaller fish. This indicates that the lipid tolerance of Atlantic cod, with respect to the effect on HSI, is size depended.

Introduction
Existing results on the effect of dietary lipid on Heposomatic index (HSI) in Atlantic cod are inconclusive and most of the conclusions are drawn from trials with fish <600 gram (Lie et al. 1986, 1988 and 1989; Hemre et al. 2000; Rosenlund et al. 2004; Grisdale-Helland et al. 2007 and Hatlen et al. 2007). General recommendations today is that Atlantic cod of all sizes should be fed low (≤ 15%) lipid diets. The present study was undertaken to investigate the effect of different lipid content in iso-nitrogenous diets on different quality measurements in cod of different size, as well as on growth.

Materials and Methods
Diets:
The composition of the diets is shown in Table 1. The diets were fed according to appetite and uneaten feed collected in Trial 2.

Fish and conditions:
- Trial 1: 550 – 800 grams, 15 fish per 650 l tanks in triplicate at 30-34‰ salinity and 10-11 degrees C.
- Trial 2: 120 – 250 grams, 60 fish per 650 l tanks in triplicate at 30-34‰ salinity and 11-12 degrees C.

Weighing and sampling:
Fish was individually weighed and fork length measured every four weeks during the trial periods after two days starving. 10 fish were sacrificed at end of trial to measure gutted weight, hand filleted to measure fillet yield. Liver weight was registered as well as the weight of intestines without liver. The same procedure was repeated on five fish from each tank at the end. Same fish samples were used for chemical analyses.

Results and discussion
There were minor effects of lipid content in the diet on most of the parameters registered, except on the HSI (Figure 2) and feed conversion ratio (FCR) (Values not shown) in the small fish in Trial 1. There was however no effect of lipid content on the HSI in the bigger fish in Trial 1 (Figure 1). This is in fact in agreement to critical analyses of the existing literature.

Conclusion
- Atlantic cod can grow well on diets with up to 28% lipid.
- High energy, due to high lipid content, seems to lower FCR in Atlantic cod.
- High lipid diets increase HSI in small cod but not in cod over 600 grams.

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References