

## ECASA - Model description template

<b>NAME of model:</b> <i>MOM (fish model, water quality model, dispersion model, benthic model)</i>	<b>Reporter/institute (a):</b> <i>Carina P. Erlandsson, Address: University of Gothenburg, Box 450, 405 30 Gothenburg, Sweden Phone no: +46317862854 Email: caer@gvc.gu.se (b)Ander Stigebrandt Address: University of Gothenburg, Box 450, 405 30 Gothenburg, Sweden Phone no: +46317862851 Email: anst@gvc.gu.se</i>
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### Short DESCRIPTION of model (b)

general description: *The MOM model can be used to calculate the holding capacity (TPF-Total Fish Production) of an area for fish farming. The model calculations are based on requirements on the water quality for fin fish in the cages, and for the benthos beneath the cages. The model contains four sub-models: a fish model, a cage water quality model, a dispersion model, and a benthic model.*

*The environmental effects of fish farming on the surrounding water and on the water quality in the farm are calculated as oxygen and ammonium concentrations in the farm and oxygen concentrations at the bottom below the farm. The model also calculates the nutrient release from the farm to the surface water. The holding capacity is expressed as the minimum of the TPF based on oxygen and ammonium concentrations in the cages and oxygen concentration of the bottom water (i.e. of  $TPF_{O_2}$ ,  $TPF_{NH_4}$ , and  $TPF_{bent}$ )*

main state variables (c): *In cages: oxygen concentration and ammonium concentration. At the bottom beneath the cages: oxygen concentration*

scale to which applicable (d): *Local (A)*

forcing data needed (e):

*Farm layout: total area of farm, depth and side length of cages, distance between cages. See sub-model forms for more information of forcing data.*

### possibly relevant INDICATORS (f)

driver:

pressure:

state: *In Cages: oxygen and ammonium concentrations, fish growth*

*At the bottom beneath the cages: oxygen concentrations, biodiversity*

impact:

response:

### STATUS of model (g)

origin(ator), present development state (has been tested, under development, etc)  
present use, claimed robustness and scientific basis of this:

*The MOM model has been applied to numerous fish farm locations all over Norway during more than a decade as a part of the MOM-system (Ervik et al., 1993., Hansen et al., 2001, Stigebrandt et al., 2004). The MOM-system (Monitoring-Ongrowing fish farms-Modelling) which is the Norwegian environmental regulations for fish farming, is designed for observation, prediction, and regulation of the local environment impact of intensive marine fish farming. The MOM model was originally developed for Salmon. During the ECASA-project and another EU project (SPEAR) a number of new species of fish will be included in the fish model and this is under progress. A mussel model for long line farming to be implemented in MOM will also be developed during the project.*

*The MOM model will be run on most sites involved in the ECASA project depending on data access. The results will be compared with local data, and an analysis of these results will be presented in a scientific paper.*

#### **IMPLEMENTATION OF MODEL**

state of implementation (h): *The implementation of new fish species is in progress and the implementation of a mussel model will soon begin.*

state of documentation: *The model MOM is described in Stigebrandt et al. (2004), and a Webb based present version with several fish species included can be found and run at [www.ancylus.net](http://www.ancylus.net). See also description of the sub-models for more references.*

intellectual property concerns (i): *All equations included in the present version of MOM are available in published papers.*

#### **TESTING**

summary of conditions and measurements needed - including critical forcing data (j)  
criteria for model rejection

#### **OTHER models**

Used with this model (k): *The FjordEnv model*

Similar models (l): *The DEPOMOD model*

#### **REFERENCES cited**

*Ervik A., Hansen, P.K., Aure, J., Stigebrandt, A., Johannesen, P., Jahnsen, T., 1997.*

*Regulating the environment impact of intensive marine fish farming I. The concept of the MOM system (Modelling-Ongrowing fish farms-Monitoring). Aquaculture 158: 85-94.*

*Hansen, P.K, Ervik, A., Schaaning, M., Johannesen, P., Aure, J., Jahnsen, A., Stigebrandt, A., 2001. Regulating the environment impact of intensive marine fish farming II. The monitoring program of the MOM system (Modelling-Ongrowing fish farms-Monitoring). Aquaculture 194(1-2): 75-92.*

*Stigebrandt, A., Aure, J., Ervik, A, Kupta Hansen, P., 2004. Regulating the environment impact of intensive marine fish farming III. A model for estimation of the holding capacity in the Modelling-Ongrowing-fish farm-Monitoring system. Aquaculture 234: 239-261.*