As from January 2010 The Israeli Journal of Aquaculture - Bamidgeh (IJA) will be published exclusively as an on-line Open Access (OA) quarterly accessible by all AquacultureHub (http://www.aquaculturehub.org) members and registered individuals and institutions. Please visit our website (http://siamb.org.il) for free registration form, further information and instructions.

This transformation from a subscription printed version to an on-line OA journal, aims at supporting the concept that scientific peer-reviewed publications should be made available to all, including those with limited resources. The OA IJA does not enforce author or subscription fees and will endeavor to obtain alternative sources of income to support this policy for as long as possible.

Editor-in-Chief
Dan Mires

Editorial Board
Sheenan Harpaz  Agricultural Research Organization
          Beit Dagan, Israel
Zvi Yaron  Dept. of Zoology
          Tel Aviv University
          Tel Aviv, Israel
Angelo Colorni  National Center for Mariculture, IOLR
               Eilat, Israel
Rina Chakrabarti  Aqua Research Lab
                Dept. of Zoology
                University of Delhi
Ingrid Lupatsch  Swansea University
                Singleton Park, Swansea, UK
Jaap van Rijn  The Hebrew University
                 Faculty of Agriculture
                 Israel
Spencer Malecha  Dept. of Human Nutrition, Food
                 and Animal Sciences
                 University of Hawaii
Daniel Golani  The Hebrew University of Jerusalem
               Jerusalem, Israel
Emilio Tibaldi  Udine University
               Udine, Italy

Copy Editor
Ellen Rosenberg

Published under auspices of
The Society of Israeli Aquaculture and
Marine Biotechnology (SIAMB),
University of Hawaii at Manoa Library
and
University of Hawaii Aquaculture
Program in association with
AquacultureHub
http://www.aquaculturehub.org

ISSN 0792 - 156X

© Israeli Journal of Aquaculture - BAMIGDEH.

PUBLISHER:
Israeli Journal of Aquaculture - BAMIGDEH -
Kibbutz Ein Hamifratz, Mobile Post 25210,
ISRAEL
Phone: + 972 52 3965809
http://siamb.org.il
State of the Art in Selective Breeding of Aquacultured Species

Bjarne Gjerde*

AKVAFORSK, Institute of Aquaculture Research, P.O. Box 5010, N-1432 Ås, Norway

Abstract

The first selective breeding programs for aquaculture species that also used sib information in the selection decisions were established in the early 1970s for Atlantic salmon and rainbow trout. Presently there are a total of about 60 such programs for about 20 different species in the world. However, still less than 5% of the world aquaculture production is from genetically improved stocks and most of these programs practice selection for a narrow breeding objective (e.g., growth only). An exception is Atlantic salmon for which close to 100% of the production is from improved stocks and selection is practiced for much broader breeding objectives including as many as 6-10 different traits (growth, sexual maturity, disease resistance, carcass quality, deformities) in some of the programs. A sustainable selective breeding program needs reliable genetic parameters and economic values for all traits of economic and strategies are important. In published literature there are few reliable estimates of genetic correlations between traits, and no objective study has been performed for economically important species on the derivation of economic values. Studies on the design of cost effective simple (mass selection) and advanced (use of sib information also) nucleus selective breeding programs for aquaculture species are few. More studies should be undertaken that take into account the high fecundity and reproductive characteristics of the species and should be performed at a predefined and acceptable rate of inbreeding. Important also are studies on the effects of new selection algorithms and mating design, new and emerging technologies like DNA-markers for both parental assignment and marker assisted selection, new technologies that can record more of the traits selected for on live breeding candidates, and procedures to obtain unbiased estimates of genetic changes, as well as studies on the long-term effects of a low but significant interaction between genotype and environment on important traits in a competitive market for genetic material. At the multiplier level, additional studies are needed on selection and mating strategies to fully capitalize both on the additive and non-additive genetic effects and how additional strategies like ploidy and sex manipulation may be used to further increase the productivity of the commercial fry. A socio-economic challenge is the need for some form of legal or biological protection measures to assure a fair share of the revenues from genetic improvement to investors and for further research and development of the breeding programs, while at the same time having access to genetic resources for further development of the programs.

* E-mail: bjarne.gjerde@akvaforsk.no