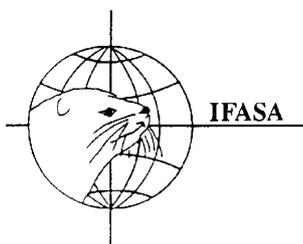
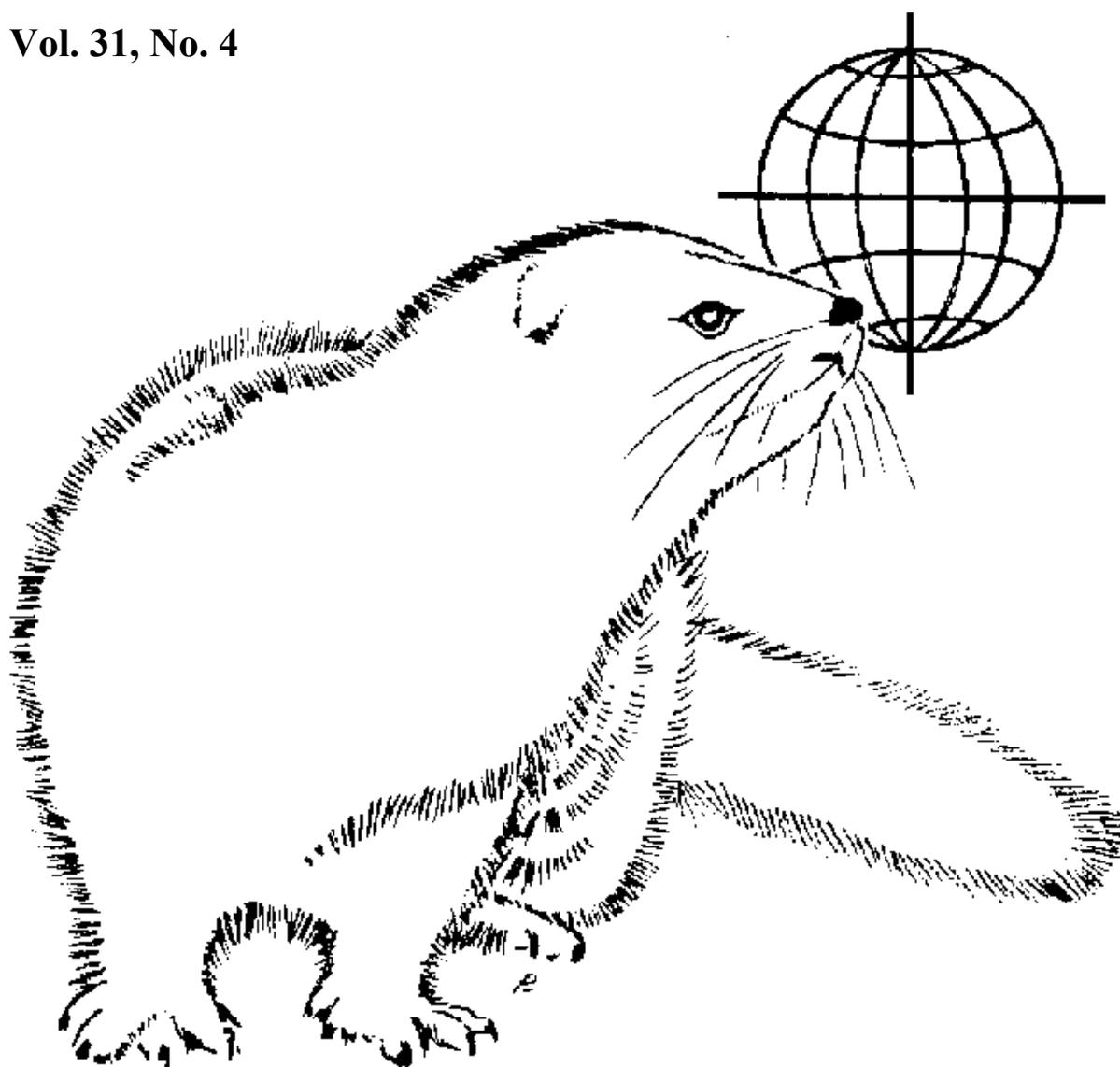


SCIENTIFUR

SCIENTIFIC INFORMATION IN FUR ANIMAL PRODUCTION

Vol. 31, No. 4



INTERNATIONAL FUR ANIMAL SCIENTIFIC ASSOCIATION

SCIENTIFUR - scientific information in Fur Animal Production.

SCIENTIFUR scientific information for those involved in fur animal production is published by the International Fur Animal Scientific Association (IFASA).

SCIENTIFUR is the contact link between fur animal researchers all over the world and serves as an outlet for scientific and other communication between researchers and others who are interested in the production of fur bearing animals. As such **SCIENTIFUR** contains reports of scientific and applied nature as well as abstracts of information published elsewhere and information regarding congresses, scientific meetings etc.

SCIENTIFUR is published as four issues per year (one volume).

REVIEWED SCIENTIFIC ARTICLES. Papers received for publication as Reviewed Scientific Articles will be sent to two referees for scientific approval.

SHORT COMMUNICATIONS. Other original papers can be published in **SCIENTIFUR** as short communications. In regard to such articles the author(s) alone is (are) responsible for the scientific validity of the article. Such papers must not exceed 4 printed pages.

EDITOR'S ADDRESS. All kinds of material suited for publication or abstracting in **SCIENTIFUR** have to be forwarded to the Editor:

Birthe M. Damgaard
SCIENTIFUR
P.O. Box 14
DK-8830 Tjele, Denmark

Tel: +45 89991512
Fax: +45 89991500
E-mail: Scientifur@agrsci.dk

SUBSCRIPTION: DKK 650.- per volume (year) including bank charges and postage.
Please note that members can subscribe, for personal use only, at a reduced rate.
Please apply for membership and further details at <http://www.ifasanet.org> or to the IFASA treasurer.

TRESURER'S ADDRESS. All correspondence regarding subscription and payment should be addressed to the Treasurer:

Steen H. Møller
IFASA
P.O. Box 14,
DK-8830 Tjele, Denmark

Tel: +45 89991346
Fax: +45 89991500
E-mail: IFASA@agrsci.dk

INDEXING: Scientific Reports and Original Reports published in **SCIENTIFUR** are indexed in common international indexes covering data regarding animal science. All titles that have been published in **SCIENTIFUR** are covered in an electronic **SCIENTIFUR INDEX**, which is updated each year. This index can be downloaded from the Webb-site: <http://www.ifasanet.org>

Regional Scientifur Representatives

Canada: Dr. Bruce Hunter: E-mail: bhunter@ovc.uoguelph.ca
USA: Dr. Jack Rose: E-mail: rosewill@isu.edu
Finland: M.Sc. Nita Koskinen: E-mail: nita.koskinen@mtt.fi
Iceland: Advisor Einar Einarsson: E-mail: einare@krokur.is
Norway: Veterinary advisor Gorm Sanson: E-mail: sanson@norpels.no
The Netherlands: Ing. Jan deRond: E-mail: info@edelveen.com
Poland: Dr. Malgorzata Sulik: E-mail: m.sulik@biot.ar.szczecin.pl

International Fur Animal Scientific Association (IFASA). Board of directors:

Dr. Bruce D. Murphy (president): E-mail: murphyb@MEDVET.Umontreal.CA
Dr. Steen H. Møller (vicepresident, treasurer): E-mail: IFASA@agrsci.dk
Dr. Tuula Dahlman: E-mail: tuula.dahlman@stkl-fpf.fi
Ing. Wim Verhagen: E-mail: info@nfe.nl
Dr. Marian Brzozowski: E-mail: brzozowskim@delta.sggw.waw.pl

SCIENTIFUR
ISSN 0105-2403
Vol. 31, No. 4



Published by **IFASA**
 INTERNATIONAL FUR ANIMAL SCIENTIFIC ASSOCIATION

1.	Contents	63
2.	Notes	67
3.	Symposiums, congresses etc.	83
	Improved mink welfare? – New regulations and research results	83
	Danish order on fur animals: Ideas and research results in relation to mink welfare. <i>S.W. Hansen</i>	
	Testing the temperament of mink in practice. <i>S.H. Møller, S.W. Hansen</i>	
	Stereotypi hos mink. <i>L.L. Jeppesen</i>	
	Breeding for behavioural traits – possible tools. <i>B.K. Hansen, P. Berg, S.W. Hansen</i>	
	Feed conversion rates during various phases of growth in relation to feeding and management. <i>S.H. Møller, B.K. Hansen, V.H. Nielsen</i>	
	Genotype – environmental interplay in mink. <i>V.H. Nielsen*, S.H. Møller, B.K. Hansen, P. Berg</i>	
	Fibre feeds and intestinal health. <i>M.S. Hedemann, H.N. Lærke, C. Hejlesen</i>	

Factors affecting early kit mortality.*A. Castella, J. Malmkvist***New knowledge of the interplay between dams and kits.***J. Malmkvist, A.R.W. Lassen, K.T.Clausen, C.D. Sauer, B. Houbak, E. Decke***Low kit survival – consequences of selection for high body weight.***B.K. Hansen, P. Berg*

Notes from the Group of Editors

This issue of *Scientific*, Volume 31, No 4, contains the abstracts of the meeting '*Improved mink welfare? – New regulations and research results*', which was held at the Faculty of Agricultural Sciences (formerly the Danish Institute of Agricultural Sciences), University of Aarhus on 18 September 2007.

On behalf of the
Group of Editors

Birthe Damgaard

Improved mink welfare? – New regulations and research results

Meeting at the Faculty of Agricultural Sciences,

University of Aarhus, Denmark,

18 September 2007

The focus of this meeting was on the new Danish order on fur animals seen in relation to recent research results. The presentations hosted were divided into three categories: 1) the order on fur animals, 2) feed conversion, and 3) kit survival. The presentations were based on the scientific work carried out at the Faculty of Agricultural Sciences, University of Aarhus, the Danish Fur Breeders' Research Center, Copenhagen Fur, and the University of Copenhagen.

Danish order on fur animals: Ideas and research results in relation to mink welfare

S.W. Hansen

The first Danish order on fur animals has entered into effect. The order is based on EU recommendations and contains regulations regarding the biological characteristics of the various fur animal species, the behavioural needs of the animals as well as directions regarding the design of cages and management procedures. This paper focuses on the regulations regarding mink production, and in relation to the subjects mentioned research results are stated

It is concluded that the welfare of mink kept in a standard production environment is good and that the new order has improved the welfare of mink further in relation to occupational materials (permanent access to straw and shelf or tube), selection for confident temperament, limited restrictive feeding, and increase peace and quietness during the nursing period. However, not all the regulations are unambiguously positive for the welfare of mink. Moving the females in order to

ensure an empty cage between each female will imply an extra strain on all the females. It has not been documented that eight days of restrictive feeding is sufficient to slim the breeding females that are often very fat. Furthermore, group housing implies an increased occurrence of bite marks compared with housing in pairs. Studies continue to be carried out in relation to improving the possibilities of occupation in mink, reducing aggression in mink kept in groups, individual feeding and the use of low-energy feed for slimming of mink without the animals feeling hungry.

Improved mink welfare? – New regulations and research results. Meeting at the Faculty of Agricultural Sciences, University of Aarhus, Denmark, 18 September 2007, 14 pp, 51 refs. Author's abstract.

Testing the temperament of mink in practice

S.H. Møller, S.W. Hansen

The new Danish order on protection of fur animals states that very fearful animals must be excluded from the breeding stock and that the breeding programmes must take special consideration to selection for exploratory animals. A fast and efficient way to apply to these regulations is by use of the stick test to find and select exploratory mink and/or exclude fearful mink. The stick test is easy to learn, fast to perform, and very reliable while the temperament revealed has a high heritability and no or positive side effects on the production. Therefore it is possible for mink farmers to comply with the

order and to implement selection for mink with a preferable temperament in farm management and at the same time improve their breeding stock in terms of adaptation, handling and production.

Improved mink welfare? – New regulations and research results. Meeting at the Faculty of Agricultural Sciences, University of Aarhus, Denmark, 18 September 2007, 7 pp, 3 tables, 1 fig., 7 refs. Authors' abstract.

Stereotypi hos mink

L.L. Jeppesen

The definition of stereotypic behaviour and the relation between stereotypy, welfare and politics is discussed. The occurrence of stereotypy may be an expression of bad welfare. However, it is not always so. This fact is usually disregarded in the public debate about welfare, and the occurrence of stereotypy is usually without reservation taken as a sign of bad welfare. Another mistaken assumption is that the amount of stereotypic behaviour in mink is significant. This political problem should be dealt with by more information on the true nature of stereotypic behaviour and its occurrence in mink. However, even after such information the immediate feeling of many people will be that there is something wrong about stereotypic behaviour. Therefore, a further reduction of the stereotypic behaviour in mink could be considered part of the political solution. This leaves the research with purposes ranging from finding methods to control the occurrence of stereotypic behaviour to continued development of the understanding of the relation between stereotypic behaviour and welfare. The control with stereotypy by means of environmental enrichment respectively selection is discussed. The use of enrichments is recommended. The use of deliberate selection is not recommended, since mink in lines selected solely against stereotypic behaviour are fearful and so insensitive to stressors that it is supposed that their welfare is impaired.

Improved mink welfare? – New regulations and research results. Meeting at the Faculty of Agricultural Sciences, University of Aarhus, Denmark, 18 September 2007, 5 pp, 10 refs. Author's abstract.

Breeding for behavioural traits – possible tools

B.K. Hansen, P. Berg, S.W. Hansen

A new legislation for fur animals came into force the 15th of January 2007 in Denmark. Regarding the breeding work it is stated in chapter 10. § 19: *Strongly timid animals may not be used for breeding. In breeding programmes, besides production traits, special attentions must be paid to traits that can improve animal health and welfare including selection for curious animals.*

The possibilities in practical farming to fulfil the law and the consequences on reproduction results by selection on behaviour traits, curious or stereotyped respectively, are discussed.

Improved mink welfare? – New regulations and research results. Meeting at the Faculty of Agricultural Sciences, University of Aarhus, Denmark, 18 September 2007, 9 pp, 2 tables, 4 figs., 18 refs. Authors' abstract.

Feed conversion rates during various phases of growth in relation to feeding and management

S.H. Møller, B.K. Hansen, V.H. Nielsen

Feed conversion rates (FC) for male + female pairs of kits have been calculated for the entire growth period from 12 to 26 weeks of age, the 'Body length growth' phase from 12 to 17 weeks of age, the 'Fat deposition' phase from 19 to 26 weeks of age, as well as for each of the 3 weeks periods. Relations between the periods and the potential use in feeding and management strategies have been investigated. On average the FC rate in the first three-weeks-period correlated well to the entire period ($r=0.60$) and thereafter the correlation declined. FC may be calculated from feed allowance as subtraction of feed leftovers has limited effect on the results. FC rates calculated from body weight rather than weight gain significantly affects the results and thus the ranking of the mink and a substantial proportion of mink with low ranks based on weight gain would be included in the breeding stock if the mink were ranked according to body weight. From a management point of view it could be advantageous to select animals in September, as it would allow

selection to take place in a low activity period and for applying a feeding strategy in the 'Fat deposition' phase that are less likely to induce reproductive problems related to obesity.

Improved mink welfare? – New regulations and research results. Meeting at the Faculty of Agricultural Sciences, University of Aarhus, Denmark, 18 September 2007, 7 pp, 1 table, 4 figs., 9 refs. Authors' abstract.

Genotype – environmental interplay in mink

V.H. Nielsen, S.H. Møller, B.K. Hansen, P. Berg*

Lines selected for high November weight on *ad libitum* (AL) and restricted feeding (RF) and for low feed conversion on *ad libitum* feeding (FE) were tested on both diets after three generations of selection. The genetic correlation between November weight on *ad libitum* and on restricted feeding was estimated to 0.92. This may indicate that November weight on the two diets is not entirely the same character. Overall, the highest average November weight was obtained by selection on *ad libitum* feeding.

Improved mink welfare? – New regulations and research results. Meeting at the Faculty of Agricultural Sciences, University of Aarhus, Denmark, 18 September 2007, 7 pp, 2 tables, 3 figs., 6 refs. Authors' abstract.

Fibre feeds and intestinal health

M.S. Hedemann, H.N. Lærke, C. Hejlesen

Three similar diets, except for the content of the fibrous dried sugar beet pulp (LF: 0%, MF: 2.5%, and HF: 5%) was used in two experiments. The digestibility of the feed was determined in one experiment and the effect of the feed on the morphology of the small intestine and the activity of digestive enzymes in the intestinal mucosa was determined in another experiment. Fifteen adult male mink divided into 3 groups was used for the digestibility trial. The digestibility of organic matter decreased when the amount of fiber in the diet

increased but more surprisingly the digestibility of fat increased and was highest in mink fed MF and HF. Three groups with 9 female mink in each group were used in the experiment where intestinal morphology and enzyme activity was investigated. Feeding with the experimental diets did not change the villous height or the crypt depth. The villi and crypt density decreased when the mink were fed the diets containing sugar beet pulp. The intestinal tract is covered by a mucus layer. The mucus layer consists, among other things, of mucin secreted from goblet cells. The mucus layer protects the intestinal surface and the thick layer is considered more protective. The area of these goblet cells was increased when the mink were fed MF or HF. It is suggested that this is because the production of mucin is increased and that the thickness of the mucus layer is increased. The activity of the digestive enzymes in the small intestine increased when the amount of sugar beet pulp in the feed increased. In conclusion, it is shown that sugar beet pulp in feed for adult mink induces changes in the gastrointestinal. The cells in the epithelial lining are more mature and the mucus layer is modified.

Improved mink welfare? – New regulations and research results. Meeting at the Faculty of Agricultural Sciences, University of Aarhus, Denmark, 18 September 2007, 9 pp, 6 tables, 5 refs. Authors' abstract.

Factors affecting early kit mortality

A. Castella, J. Malmkvist

The objective of this study was to describe risk factors affecting mink dam and litters leading to early kit mortality, using multivariate statistical analysis to interrelate several behavioural and other variables sampled around, during and after parturition. We had 268 deliveries. Body conditions were estimated once a week from March 1 to delivery. During April behaviours were observed through scanning observations. A subset of 29 females in their first gestation were recorded on video and analysed for behaviour and course of parturition from four hours before, until twenty-four hours after birth of the first kit. Five days after delivery we tested for maternal responsiveness, through the 'kit retrieval test'.

The course of parturition was crucial for kit viability. The duration of parturition and inter-birth intervals affected the kit weight, whereas the behaviours during and following parturition appear to affect the mortality of kits within the first week of life. Behaviours correlated negatively to kit survival could arise as a consequence of a troubled parturition, and therefore it will be crucial to consider what courses a troubled parturition. Dam body condition did not affect the kit mortality directly, but may affect the course of parturition through the kit weight the day after birth. We found no correlations between a stereotyping nature and dam body condition, course of parturition, litter size or kit mortality. Additionally, it appeared that there were no correlation between a stereotyping nature and stereotyping after parturition, the later seemed more like a response to the course of parturition. Behaviours affecting the early kit mortality shifted from during parturition to the hours after, and the picture may change again in the following days, as we saw no correlation of maternal responsiveness five days after delivery.

Improved mink welfare? – New regulations and research results. Meeting at the Faculty of Agricultural Sciences, University of Aarhus, Denmark, 18 September 2007, 11 pp, 3 figs., 13 refs. Authors' abstract.

New knowledge of the interplay between dams and kits

J. Malmkvist, A.R.W. Lassen, K.T.Clausen, C.D. Sauer, B. Houbak, E. Decker

We present in this paper results from experiments performed at the farm of Research Centre Foulum, University of Aarhus, in the period 2006-2007 regarding (1) The effect of female activity on the parturition and the kit survival (Bachelor thesis, Cathrine D. Sauer), (2) Analysis of mink kit vocalisations (Project in behavioural biology, Karin T. Clausen), and (3) The effects of selection for temperament and the effects of the duration of parturition on the senses, motor and behavioural ontogeny in mink (M.Sc. thesis, Anne Rikke W. Lassen).

In experiment 1, we found that a long duration of parturition resulted in fewer surviving kits day 7

after birth, whereas we were not able to document significant difference in the course of parturition and kit survival between two groups of females selected for high (n=11) or low (n=12) level of activity and stereotypic behaviour. Both groups spent about 90% of their time in the nest box within the first 24 hours after the delivery. From experiments in part 2, we now know that mink kits are able to produce ultrasonic vocalisation (up to 50.000 Hz), when placed away from the mother/warm nest. These ultrasonic sounds were of a relative long average pulse duration of 264-874 ms. Palomino kits had a higher variation in pulse durations than kits of a black colour type. Palomino females had a reduced kit retrieval compared to black females. Vocalising kits were in a kit retrieval test retrieved faster than non vocalising kits, regardless of colour type. In part 3, we found that selection for confident behaviour may result in an accelerated ontogeny of senses and motor abilities, and result in more exploratory/play behaviour in offspring, observed during the period 21 to 154 days after birth, and compared to offspring from a fearful and from a production line. In addition, more confident kits used the drinking nipple at an earlier age. Mink kits react to a sound stimulus earlier than previously reported, since 47.2% of confident kits, 27.3% of control kits, and 11.5% of fearful kits reacted already on day 27 after birth. A long duration of parturition may result in a delay in age of water drinking, but otherwise we found no significant effects of the duration of parturition on ontogeny in mink. However, the data analysis is still ongoing in several of these experiments, so more interesting results may appear.

Improved mink welfare? – New regulations and research results. Meeting at the Faculty of Agricultural Sciences, University of Aarhus, Denmark, 18 September 2007, 10 pp, 1 table, 15 refs. Authors' abstract.

Low kit survival – consequences of selection for high body weight

B.K. Hansen, P. Berg

An unfavourable genetic correlation was found between female kit October body weight and litter size and percent survived kits in her litter in the following production period. This means that if we continue to select for high body weight and feed the

animals in the same way, then the litter size will decrease.

The analyses include records from 1357 litters from black yearling females with 8576 kits in the period from 1997 to 2001 from the project "Selection for kit growth taking welfare of the dam into account". Bivariate animal models are used including effect of production year and selection line.

Improved mink welfare? – New regulations and research results. Meeting at the Faculty of Agricultural Sciences, University of Aarhus, Denmark, 18 September 2007, 9 pp, 5 tables, 27 refs. Authors' abstract.

INSTRUCTIONS FOR AUTHORS

SCIENTIFUR is published as four issues per year in the following way:

- Three issues containing short communications (max. 4 pages), abstracts, letters, book reviews etc.
- One issue entitled "Fur Animal Science" containing only reviewed articles

REVIEWED SCIENTIFIC ARTICLES should not exceed 6 printed pages (=12 typewritten A4 pages with double spacing including figures and tables). Additional pages will be charged to the author(s) at Euro 100 per printed page. Scientific articles will be sent to two referees for scientific approval.

Papers submitted for publication as reviewed scientific articles are received with the understanding that the work has not been published before, and is not considered for publication elsewhere and has been read and approved by all authors. Animal experimental methods reported in **SCIENTIFUR** should meet ethical standards of animal treatment.

SHORT COMMUNICATIONS. Other original papers can be published in **SCIENTIFUR** as short communications. In regard to such articles the author(s) alone is (are) responsible for the scientific validity of the article. Such papers must not exceed 4 printed pages.

Please indicate if an original article should be published as a Reviewed Scientific Article or as a Short Communication.

MANUSCRIPTS

All manuscripts must be sent in three copies and preferably accompanied by an electronic copy on a diskette or by E-mail. The electronic files should preferably be in Microsoft Word. The material should be sent to:

SCIENTIFUR/Danmarks JordbrugsForskning, P.O.Box 14, DK-8830 Tjele, Denmark or

E-mail: Scientifur@agrsci.dk

Manuscripts must be in English, typed double spaced with page and line numbering and consisting of:

Title, which should be concise and informative, but as short as possible, and contain the main key words.

Authors name(s) as well as name(s) and address(es) of the institutions to which the work is attributed. E-mail address of the corresponding author should preferably be included.

Summary/Abstract, which should not exceed 150 words.

Keywords in alphabetic order if not included in the title.

Text. The text should normally be divided into: Introduction, Material and Methods, Results, Discussion, Acknowledgements and References and follow the internationally accepted rules. Double documentation in both figures and tables will not be accepted.

Illustrations. All graphs, photos and pictures are considered as figures and have to be labelled on the reversed side of the sheet with number, authors name and indication of orientation. All drawings have to be professionally drafted (photocopies are not an acceptable standard). The illustrations included in the electronic version should be as JPG-, GIF- or TIF-files. Any halftones must exhibit high contrast and text and other details must be large enough to retain the readability after reduction of figure size to single column (width 80 mm); the width of 170 mm can be accepted in special cases.

Colour illustrations can be included in the electronic version of **SCIENTIFUR**. Any colour illustrations in the printed copies must be paid by the author.

Tables. Each table should be typed on a separate page. Tables must be numbered consecutively with Arabic numerals, and have a self-explanatory title. Tables should be planned to fit a final width of 80 or 170 mm.

References should be kept to a pertinent minimum. References in the text should be made according to the following examples: Nielsen, 1992; Hansen & Berg, 1993; Bakken et al., 1999. The list of references should be arranged in alphabetic order according to the name of the first author and the year of publication within the names. The year of publication should be written between the name(s) and the title.

Reprints. Reprints can be ordered from the editor according to individual agreement.