Fish Culture Performance in the Tropics

SYMPOSIUM PROCEEDINGS

Rodrigo Roubach
Levy de Carvalho Gomes
Don MacKinlay

International Congress on the Biology of Fish

Tropical Hotel Resort, Manaus Brazil, August 1-5, 2004

International Standard Book Number(ISBN) 1-894337-56-5

Notice

This publication is made up of a combination of extended abstracts and full papers, submitted by the authors without peer review. The formatting has been edited but the content is the responsibility of the authors. The papers in this volume should not be cited as primary literature. The Physiology Section of the American Fisheries Society offers this compilation of papers in the interests of information exchange only, and makes no claim as to the validity of the conclusions or recommendations presented in the papers.

For copies of these Symposium Proceedings, or the other 20 Proceedings in the Congress series, contact:
Don MacKinlay, SEP DFO, 401 Burrard St., Vancouver BC V6C 3S4 Canada Phone: 604-666-3520 Fax 604-666-0417 E-mail: mackinlayd@pac.dfo-mpo.gc.ca

Website: www.fishbiologycongress.org

PREFACE

The present trend in fish culture is to develop better technology towards higher yields and faster growing fish, using less space and less water exchange rates. Implicating in the need to a stronger understand on fish biology processes and its adaptable physiology. This symposium focus on methods of incorporating knowledge on how different fish species, their biology, and physiology can be applied and used for a better management and augmenting fish culture production towards the increasing necessity of food (fisheries) production, environmental awareness, and sustainability.

Symposium Organizers:

Rodrigo Roubach
Levy de Carvalho Gomes
Don MacKinlay, Fisheries and Oceans Canada

TABLE OF CONTENTS

Download the Complete Proceedings

THE USE OF ANESTHETICS

FOR TAMBAQUI (*COLOSSOMA MACROPOMUM*)

Levy de Carvalho Gomes
Embrapa – Centro de Pesquisa Agroflorestal da Amazônia Ocidental,
Caixa Postal 319, CEP 69011-970, Manaus, AM.
E-mail: levy@cpaa.embrapa.br.

Rodrigo Roubach, Michele Ferreira Façanha, and Adalberto L. Val
Instituto Nacional de Pesquisas da Amazônia,
Caixa Postal 478, CEP 69011-970, Manaus, AM.
E-mail: roubach@inpa.gov.br; michele@inpa.gov.br; dalval@inpa.gov.br

EXTENDED ABSTRACT ONLY – DO NOT CITE

Introduction

Anesthetics are important in fish culture to reduce handling stress and mortality. A number of chemicals are used for fish anesthesia, but conventional anesthetics, such as tricaine methane sulphonate (MS-222), quinaldine, and 2-phenoxyethanol, are toxic to species and expensive (Hovda and Linley 2000).

The most widely available anesthetic in Brazil are benzocaine, menthol and eugenol. Results obtained in several reports concluded that these anesthetics meet most of the criteria established for an ideal fish anesthetic (Ross and Ross 1999).

Tambaqui, *Colossoma macropomum*, is widely used in aquaculture systems throughout Brazil (Araujo-Lima and Goulding 1997). At present, there is not an established dose of any kind of anesthetic drug for this species. For the proper usage of an anesthetic, it is important to establish the best dosage, since inappropriate dosages would not have the desired effect and could even kill fish. Therefore, the objective of this research was to determine the best protocol for using benzocaine, menthol and eugenol as an anesthetic in juvenile tambaqui.

Material and Methods

Tambaqui juveniles were obtained from the Balbina hatchery (Amazonas, Brazil) and acclimated for at least 30 days. The first series of experiments examined the effect of benzocaine concentration on behavior and stress of tambaqui juveniles. Fish were individually exposed to 5 differents dosages of benzocaine, menthol and eugenol for a period of ten minutes. Behavioral responses were noted, and then fish were removed from the anesthetic solution and placed in a 60-L aquarium containing 40 L of aerated fresh rearing water for recovery. Immediately following recovery, blood was drawn from the caudal vein with a heparinized syringe from six fish of each benzocaine concentration. Hematocrit was determined in glass microcapillary tubes by centrifugation at 12,000 *g* for 10 min. Blood plasma was separated by centrifugation at 3,000 *g* for 10 min and glucose was measured using an enzymatic glucose assay (Doles®, Goias, Brazil). Evaluations of the stages of anesthesia were developed using the criteria outlined in Stoskopf (1993). Recovery time was defined as the time needed for fish to regain equilibrium and begin active swimming.

Results and Discussion

Fish exposed to tested anesthetics passed sequentially through various stages of anesthesia (Table 1). The best concentration for surgical anesthesia with mentol, benzocaine and eugenol is respectively 150, 100 and 66 mg/L. Glucose values were similar among all tested anesthetics (Table 2). The anesthetics tested are all widely used in aquaculture in Brazil as an aid in health evaluations, fish biometry, broodstock management, surgical procedures and in general fish handling. The main reasons for its use are: low cost, availability, ease of handling, and safety. Other anesthetics, such as MS-222, clove oil and 2-phenoxyethanol, are difficult to obtain by Brazilian aquaculturists. As imported commodities, they are expensive: for example, the cost required for an effective dose of MS-222 is ten times grather than a similar effective dose of benzocaine. Stress response has been reported for different anesthetic drugs, such as MS-222 and quinaldine (Ross and Ross 1999), and normally they are associated with an exposure to high anesthetic dosages or a prolonged exposure. Stress is probably caused by the strong fish reaction to the first contact with the anesthetic, these patern do not occur with tambaqui since glucose values were all similar among the tested anesthetics. The results confirmed that mentol, benzocaine and eugenol are an adequate anesthetic for tambaqui.

Table 1. Behavioral events of tambaqui juveniles exposed to the best concentration of: benzocaine (100 mg/L), menthol (150 mg/L) and eugenol (66 mg/L). Stages of anesthesia are based on the criteria of Stoskopf (1993)

Anesthetic	Behavioral events		
	Loss of equilibrium	Minimal opercular movement	Recovery of equilibrium
Benzocaine	0.53±0.34	2.71±0.64	4.59±2.27
Menthol	0.29±0.02	2.16±0.34	10.93±1.72
Eugenol	0.83±0.46	2.30±0.50	8.17±2.86

Table 2. Tambaqui juveniles plasma glucose levels when exposed to the best concentration of: benzocaine (100 mg/L), menthol (150 mg/L) and eugenol (66 mg/L).

Anesthetic	Glucose (mg/dL)
Benzocaine	67.9±13.0
Menthol	73.40±11.69
Eugenol	79.4±12.5

References

Araujo-Lima C. and M. Goulding. 1997. So fruitful a fish. Ecology, conservation, and aquaculture of the Amazon's tambaqui. Columbia University Press, New York, N.Y., USA.

Hovda, J. and T.J. Linley. 2000. The potential application of hypothermia for anesthesia in adult pacific salmon. North American Journal of Aquaculture 62:67-72.

Ross, L.G. and B. Ross. 1999. Anaesthetic and sedative techniques for aquatic animals. Blackwell Science, Oxford, UK.