Available online at www.sciencedirect.com

Aquaculture

Aquaculture 257 (2006) 309–315

www.elsevier.com/locate/aqua-online

Evaluation of PIT system as a method to tag fingerlings of gilthead seabream (*Sparus auratus* L.): Effects on growth, mortality and tag loss

A. Navarro, V. Oliva, M.J. Zamorano, R. Ginés, M.S. Izquierdo, N. Astorga, J.M. Afonso *

Grupo de Investigación en Acuicultura, Instituto Universitario de Sanidad Animal y Seguridad Alimentaria, Universidad de Las Palmas de Gran Canaria, Trasmontaña s/n, 35416, Arucas, Spain

Received 7 September 2005; received in revised form 25 January 2006; accepted 28 February 2006

Abstract

This study examines the utility of Passive Integrated Transponder (PIT) tagging system in fingerlings of gilthead seabream, *Sparus auratus* L. Two different body positions (abdominal, dorsal) and four weight classes (2–3 g, 3–4 g, 4–5 g, 5–8 g) were tested in three experiments. Tag loss rate, as well as its effect on growth and mortality rates, was determined. Times of handling and healing were also assessed. Fish tagged in the abdominal cavity showed a significantly lower tag loss rate (14%) than those given dorsal muscle implants (40%). No differences were found in growth within experiment between tagged and untagged fish, their final mean weight ranging between 6–39 g and 6–38 g, respectively. There was no difference in mortality between tagged and untagged fish at any position (0–3.4% and 0–2.1%, respectively). Fish smaller than 3 g suffered significantly higher mortality (14.3%), indicating that the PIT tags are not suitable for very small individuals. PIT retention rate was 100% above 4 g, irrespective of the personal expertise in tagging. Mean tag application time was 19 s per fish. Mean wound healing time was close to 20 days. Hence, these results showed that PIT tagging of gilthead seabream above 3 g is feasible because it does not affect growth or mortality.

Keywords: Identification; Gilthead seabream; *Sparus auratus* L.; Passive integrated transponder; Tagging system; PIT tag

1. Introduction

The gilthead seabream (*Sparus auratus*) is an important species in Mediterranean aquaculture as showed by total production of 100,300 tons (FEAP, 2004). Nowadays, breeding programs are being developed on both local (Afonso et al., 1998; Montero et al., 2001; Gorshkov et al., 2002) and industrial scales. Identification of individual fish under selection schemes is very important because the knowledge of family structure is essential in the estimation of genetic parameters and breeding values. Moreover, precise estimates for the former require offspring to be kept together in order to avoid additional common environment sources (Herbinger et al., 1999). For this reason, fish recognition under these conditions has to be achieved using unequivocal tags.

* Corresponding author. División de Acuicultura Instituto Universitario de Sanidad Animal y Seguridad Alimentaria, C/. Trasmontaña s/n, 35416, Arucas, Las Palmas, Spain. Tel.: +34 928 451112; fax: +34 928 451142.

E-mail address: jafonso@dapat.ulpgc.es (J.M. Afonso).

0044-8486/$ - see front matter © 2006 Elsevier B.V. All rights reserved.
doi:10.1016/j.aquaculture.2006.02.072

Fish may be tagged with internal or external systems. External systems have the advantages of being economical, easy to apply and do not require sophisticated equipment (Moffett et al., 1997). However, they carry the potential disadvantages of affecting growth, health and survival (Berg and Berg, 1990; Bergman et al., 1992; Moffett et al., 1997). On the contrary, internal systems, such as the Passive Integrated Transponders (PIT), appear to have little or no effect on fish growth and survival (Prentice et al., 1989; Quartararo and Bell, 1992; Baras et al., 1999, 2000; Gries and Letcher, 2002).

Tagging systems need to be tested for each species because of differences in susceptibility to anaesthesia and manipulation, capacity for recovery, growth rate and morphology. Thus, several studies have been carried out on salmonids such as sockeye salmon, *Oncorhynchus nerka* (Prentice et al., 1989), Atlantic salmon, *Salmo salar* (Gries and Letcher, 2002) and chinook salmon, *Oncorhynchus tshawytscha* (Dare, 2003), perches such as Eurasian perch, *Perca fluviatilis* (Baras et al., 2000) and Golden perch, *Macquaria ambigua* (Ingram, 1994), Nile tilapia, *Oreochromis niloticus* (Baras et al., 1999), rohu carp, *Labeo rohita* (Mahapatra et al., 2001), bullhead, *Cottus gobio* (Bruyndoncx et al., 2002) and in juveniles of red snapper *Pagrus auratus* (Quartararo and Bell, 1992). Until present there are no reports concerning tagging of gilthead seabream, despite its importance in breeding programs. Thus, this study was conducted to examine the utility of Passive Integrated Transponder (PIT) tagging system in fingerlings of gilthead seabream. Tag loss rate, as well as its effect on growth and mortality rates was determined in different fish sizes and two different body locations. Times of handling and healing were also assessed.

2. Materials and methods

Three consecutive experiments were carried out to determine: (a) a suitable tag body location (Experiment 1) and (b) the lower fish size (Experiments 2 and 3), considering in both cases tag loss rate and tagging effects on mortality and growth. All experiments were carried out at the Canary Institute of Marine Sciences (Gran Canaria, Canary Islands, Spain).

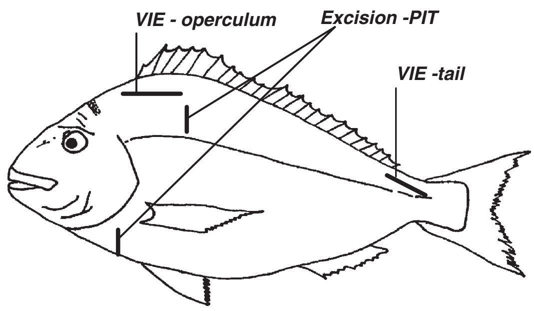

Fig. 2. Tag positions on the fingerling gilthead seabream. *Excision-PIT*, locations used to tag fish with PIT (PIT-A, abdominal cavity; PIT-M vertebral back muscle). *VIE-operculum*, location to tag control fish with VIE system. *VIE-tail*, location to tag PIT tagged fish with VIE system (PIT-A, left side; PIT-M, right side).

2.1. Tagging protocol

All fish were anaesthetised with chlorobutanol (200 mg/L) prior to tagging with Passive Integrated Transponders (PIT; Trovan Ltd., UK). PIT tagging was carried out with tags of 0.096 ± 0.0007 g weight and 2.05×11 mm size, previously immersed in alcohol and introduced horizontally into the fish using a syringe. Iodine was applied after the injection. Two locations were used to tag fish: (i) the abdominal cavity between the pelvic fins and the lower maxilla (PIT-A; Fig. 1A) and (ii) the vertebral back muscle (PIT-M; Fig. 1B). Previously to PIT injection, a 2.7 mm excision was applied (Fig. 2). PIT codes were detected by ARE H5 reader (Trovan Ltd., UK).

Due to PIT tagged and untagged fish were cultured in the same tanks, both fish classes were also tagged with Visible Implant Elastomer (VIE; Northwest Marine

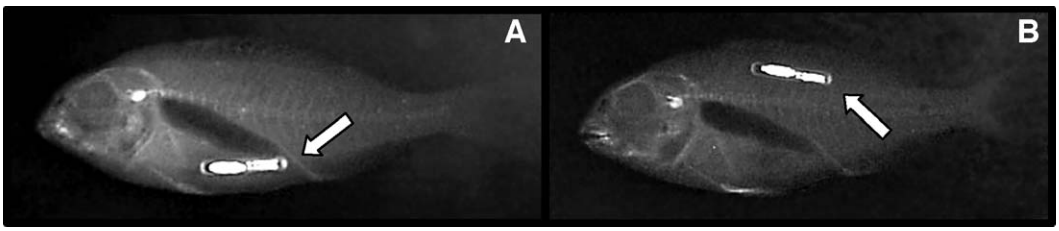

Fig. 1. X-rays of gilthead seabream fingerlings tagged with PITs. (A) Abdominal cavity PIT (PIT-A), below the swim bladder. (B) Vertebral back muscle PIT (PIT-M).