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Use of eye lens diameter and weight as an age indicator in the carangid fish, *Decapterus russelli* (Pisces: Carangidae) from Gulf of Oman: Preliminary observation

Laith A. Jawad, Juma M. Al-Mamry, Ahlam Al-Kharusi and Saoud H. Al-Habsi[1]
Marine Science and Fisheries Centre, Ministry of Agriculture & Fisheries Wealth, Muscat, Sultanate of Oman
[1]Directorate of Fisheries Research, Ministry of Fisheries Wealth, Sultanate of Oman
*Corresponding author: laith_jawad@hotmail.com

Abstract
Specimens of *Decapterus russelli* have been collected from Lema, north of the Gulf of Oman. The ocular lens diameter and weight were tested as an additional age indicator to those already in use. The results showed that this technique could be adopted for determining the age of the species *Decapterus russelli* when the specimens are in the second year of age in case of eye lens diameter. On the other hand, eye lens weight failed to separate between the four age groups observed. The method is especially useful for age determination when otolith or scale ring are not visible or when false rings give erroneous reading.

Key words: Eye lens diameter, Eye lens weight, Ageing, *Decapterus russelli*

Introduction

Eye lenses as an age indicator have been applied to a wide variety of animals since proposed by Lord (1959) and used this technique for birds and animals other than fish Friend (1967). Teska and Pinder (1986) used eye lens weight to determine the effect of nutrition on age determination in vertebrates. The application of this technique is so limited in these animals, it being only possible to distinguish between juveniles and adults. Several authors concluded that both eye lens parameters (lens diameter and weight) can be used to estimate the age of fishes (Carlton and Jackson 1968, Crivilli 1980, Saleem *et al.* 1990, Douglas 1987, Al-Hassan *et al.* 1991, 1992, Al-Hassan and Al-Sayab 1994, Conides and Al-Hassan 2000, Jawad 2001, 2003, 2004, Jawad *et al.* 2001).

Age determination is an important step in the process of studying growth in fish species. The method involves counting of scale or otolith annuli and usually requires the measurements of a large number of specimens (Fletcher 1991). Otolith and scale readings require a variable and considerable effort to prepare each specimen and even then the readings are subject to both systematic and random errors in interpretation and

require independent validation (Beamish 1979). Thus, a considerable time is needed to acquire the skill necessary for consistent interpretation of the materials. Hence, the aim of this study is to determine the validity of the eye lens diameter and weight as age indicators in the Gulf of Oman fish, *Decapterus russelli* and to establish a faster method for ageing fishes beside the conventional methods of scale and otolith.

Materials and methods

Specimens of *Decapterus russelli* (395 nos.) were collected from the Lema north of the Sea of Oman (Gulf of Oman) during the period March to May 2010. Fishes were taken to the laboratory and the diameter and weight of the eye lens were taken to the nearest mm and g respectively following the procedure of Jawad *et al.* (2004). The lenses were extracted, dried at room temperature (25°C). The measurement of the lens in each side of the animal was kept separate. The large bone such as operculum and preoperculum were used to determine the age following Al-Hassan and Al-Sayab (1994). The bones on both left and right sides were twice read independently, using an ordinary dissecting microscope for verification. One way analysis of variance followed by Duncan's multiple range test (Harraway 1997) were applied to test the differences between the total length of the fish and its age.

Results and discussion

The age of *Decapterus russelli* samples ranging from less than one year to two years was determined. The total length observed in different age classes of the species in question showed that body size is variable within an age class and considerable overlap exists between these age classes ($p>0.05$). This is considered as one of the reasons for using eye lens diameter as an age indicator (Fig. 1).

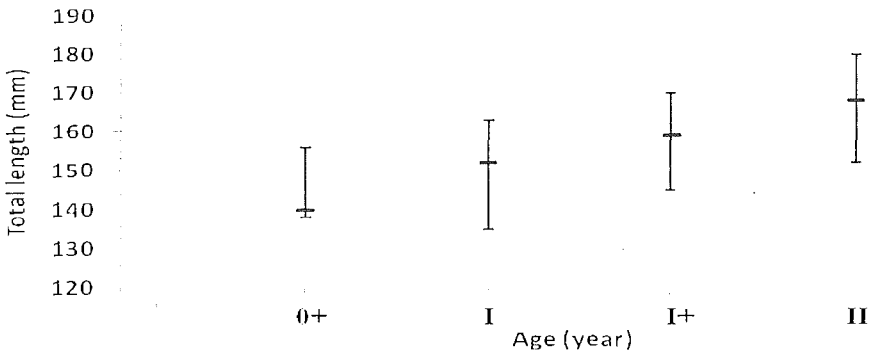

Fig. 1. Total length *vs* age (determined from opercular bone) of *Decapterus russelli* Vertical bars represent range of fish total length and horizontal lines represent mean fish length.

The average lens diameter showed a considerable increase with age for the species under consideration (Fig. 2). This increment is obvious in fishes belonging to age class I^+ and II ($p>0.05$). The overlap in lens diameter between young of the year class and Classes I & I^+ invalidates any accurate age determination for fish samples younger than two years of age. Carlton and Jackson (1968) and Jawad (2001) reached the same conclusion with carp and tilapia respectively when working on a small sample size and with fish not older than five years. Thus, only two years old can be effectively separated from the remaining age groups on the basis of lens diameter ($p<0.05$). On the other hand, it is not possible to differentiate fishes belonging to the four age groups on the basis of eye lens weight (Fig. 3).

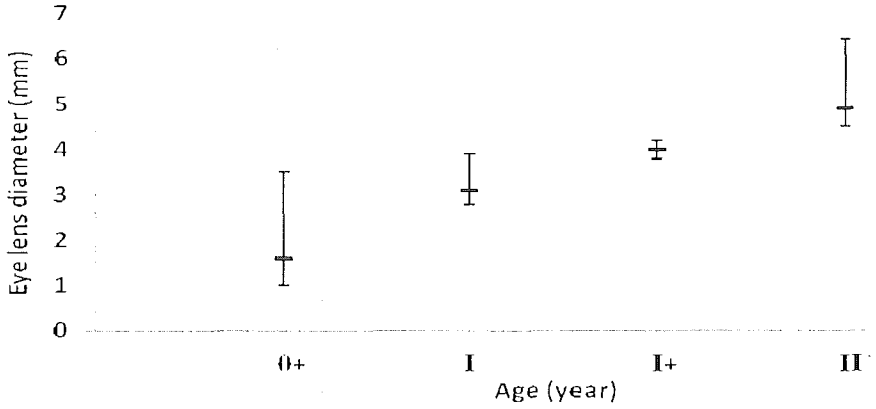

Fig. 2. Lens diameter *vs* age (determined from opecular bone) of *Decapterus russelli* Vertical bars represent total range of lens diameter and horizontal lines represent mean diameter.

Fig. 3. Lens weight *vs* age (determined from opercular bone) of *Decapterus russelli* Vertical bars represent range of lens weight and horizontal lines represent mean lens weight.

Gerking (1966) showed how different environmental factors could alter the growth rate in the bluegill *Lepomis macrochirus* and Swedberg (1965) summarized the various growth rates of drum, *Aplodinotus grunniens* from different areas in the United States. Environmental conditions must be considered in applying the lens technique (Burkett and Jackson 1971). Crivilli (1980), working on carp, stated that in the reproductive period energy is transformed from somatic to gonadal growth. Since the increment in lens diameter and weight is closely correlated with somatic growth, the variation in individual reproductive development could result in an increased variation in lens weight within an annual group. In other words, the growth rate during the reproductive period drops down due to the concentration of body on the reproductive metabolism. This drop in growth rate will affect the different parts of the fish body including the eye lens. This will end up giving variable results not in accordance with the general growth rate of the individual.

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