



Original article

Structural organization of the thyroid gland and interrenal tissue with reference to endocrine parenchyma in short mackerel, *Rastrelliger brachysoma* (Bleeker, 1851)



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ABSTRACT

The first investigations of the thyroid gland and interrenal tissue with reference to the endocrine parenchyma of short mackerel *Rastrelliger brachysoma* were subjected to histological analysis. Specimens were collected during the fishing season (October to November 2013) from the Upper Gulf of Thailand. Under a light microscope, the thyroid gland of *R. brachysoma* was distinctly found located within the branchial region. Within this gland, it consists of several follicles among afferent branchial arteries. Each follicle exclusively contained a colloid that was surrounded by a simple, cuboidal, follicle epithelium. Histological study showed that the localization of interrenal tissue was in the anterior kidney. This tissue was composed of two parts based on the structural compositions and cell types; (i) the stromal compartment was constituted of various interrenal cells and (ii) the interstitial compartment contained the connective tissue, leucocytes and blood sinuses, with reference to the lymphatic tissue.

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Introduction

The structural and histological organization of the endocrine parenchyma of fish have been exclusively reported including the pituitary gland, urophysis, endocrine pancreas, corpuscles of Stannius, thyroid gland and interrenal tissue. All of these organs are very important because they are associated with the maintenance of a steady physiological state or homeostasis (Genten et al., 2008).

Among the endocrine parenchyma, the structure of the thyroid gland in a teleost has been described and it is considered as the largest endocrine organ (Genten et al., 2008). It is similar to a tetrapod (Genten et al., 2008). Its localization in several fish can be found in the branchial region of the head (Genten et al., 2008). Under a light microscope, the thyroid gland consists of numerous follicles surrounding the ventral aorta and the afferent branchial arteries. Each follicle is made up of a simple, cuboidal epithelium

with an oval nucleus surrounded by the basophilic cytoplasm. These characterizations, as mentioned above, have been extracted and investigated in a variety of fish species including *Epinephelus aeneus* (Abbas et al., 2012), *Garra congoensis*, *Scyliorhinus canicula* and *Parachanna obscura* (Genten et al., 2008) and *Channa gachua* (Misra, 1990). Within another endocrine organ in the anterior part of kidney, the interrenal tissue was found containing several interrenal cells. These cells are histologically arranged as a cord among the blood vessels. Many observations indicated that the function of these cells is to directly secrete corticosteroids, known as a stress hormone (Genten et al., 2008). Moreover, other investigations reported that it was also related to the regulation of carbohydrate and protein metabolism and osmoregulation in fish species (Jung et al., 1981; Takahashi et al., 2013).

Up-to-date information regarding the thyroid gland and interrenal tissue in short mackerel, *Rastrelliger brachysoma* (Bleeker, 1851) has not been reported, despite the fact that this marine fish is commercially important, particularly to commercial marine aquaculture in Thailand. Therefore, an understanding of the basic details of the structural organization of the thyroid gland and interrenal

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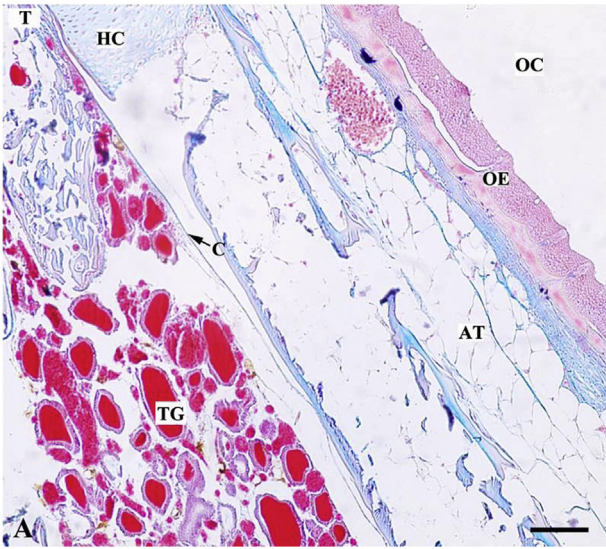


Fig. 1. Section through the branchial region: in this micrograph the thyroid gland (TG) can be seen and is surrounded by connective tissue (C). (AT = adipose tissue; HC = hyaline cartilage; OC = oral cavity; OE = oral epithelium; T = tongue). (Scale bar = 200 μ m).

tissue of this species, using histological approaches, was a primary requirement prior to the investigation of the hormonal activities of the reproductive cycle in the future studies.

Materials and methods

Fish sampling

Live adult *R. brachysoma* (n = 10) samples were obtained during the fishing season (October to November 2013) using a bamboo strake trap in Samut Songkram province, Thailand in the Upper Gulf of Thailand (13°16'18.4" N, 100°02'13.4" E). The average standard length of all sampled fish was about 17.2 cm with a weight of approximately 70.8 g. The species identification was based on the identification key in [Food and Agricultural Organization \(1999\)](#).

Histological procedure

All fish were euthanized using the rapid cooling method ([Wilson et al., 2009](#)) and fixed in Davidson's fixative right after capture for 36–48 h. In each sample, the branchial regions and kidney were collected following the standard histological technique ([Humason, 1979](#); [Bancroft and Gamble, 2008](#)). Paraffin blocks

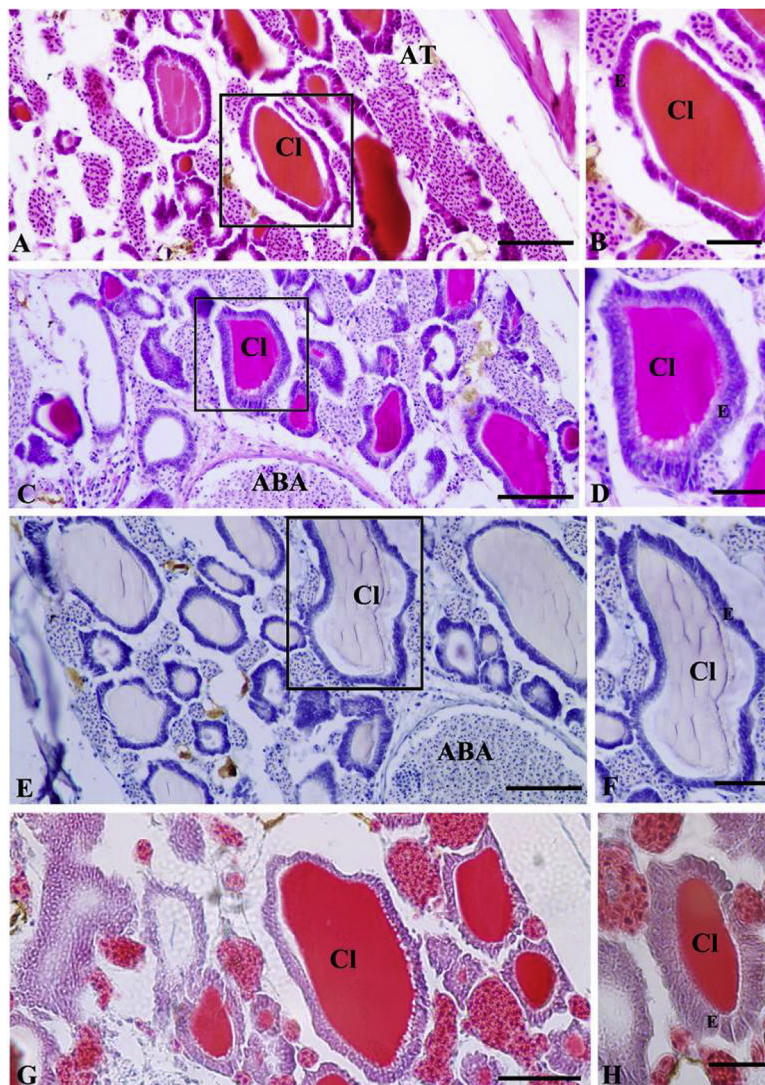


Fig. 2. Section through the thyroid gland containing several follicles (A–H): in this micrograph of a follicle, the surrounding simple, cuboidal epithelium (E) can be seen. It also contains the colloid (Cl). (ABA = afferent bronchial arteries; AT = adipose tissue). (Scale bars A,C,E,G = 100 μ m; B,D,F,H = 20 μ m; A,B, H&E; C,D, PAS; E,F, AB; G,H).

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