Diagnostic imaging of a renal adenoma in a Red Oscar (*Astronotus ocellatus* Cuvier, 1829)

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Abstract:
This case report describes the radiographic, ultrasonographic and computed tomographic (CT) examination of an abdominal swelling in a Red Oscar (*Astronotus ocellatus* Cuvier, 1829). While radiography only demonstrated caudoventral compression of the swimbladder ultrasonography found a huge tumor-like parenchyma in the caudal abdomen. CT studies detected a possible connection between the tumor and the kidneys. Necropsy and pathohistology were performed. A papillary-cystic adenoma of the kidney was diagnosed.

Introduction:
In the past most diagnoses of fish diseases were made through euthanasia and necropsy because clinical or physical evalution of fish and available diagnostic tests were limited [1].
Today diagnostic imaging techniques are used complementing further examination. Radiography is mainly used for detecting skeletal [1-6] and swimbladder disorders [1,7,8]. Coelomic detail is poor in fish, therefore evaluation of the coelomic soft tissues is limited [1]. Some authors used contrast studies of intestines and kidneys to varify passage times [9,10]. obstruction [11], perforation [12] and mass defects. Intraperitoneal and intravenous contrast applications have been described in carps[12]. The anatomy of the skeletal and digestive tracts of various fish species have been compared [13].
The main purpose of ultrasonography seems to determine the sex and maturational status of commercially used fish [14,15,16] or their general health status [17-20]. Only very few papers describe ultrasonography [21] or CT [6,22] in pet fish.

In the following the combined radiographic and ultrasonographic diagnosis of abdominal enlargement in a Red Oscar is described.

Case History Report:

A 8 year old female Red Oscar (*Astronotus ocellatus* Cuvier, 1829) with abdominal swelling was presented. The owner reported the beginning of abdominal swelling three months before presentation and suggested egg retention or obstipation. In physical examination the fish was depressed and anorectic. Additional differential diagnoses were ascites or neoplasia.

For radiologic investigation the fish was wrapped in a thin wet towel and placed in right lateral (fig. 1) and sternal recumbency (fig. 2) on the film cassette. On the lateral whole body radiograph a round homogenous soft tissue mass that compressed the swimbladder from caudoventral was visible. Otherwise the radiographs were normal. An additional ultrasonographic examination was made to verify this mass. The unsedated fish was held in right lateral recumbency near the water surface. Two-dimensional real time B-mode ultrasonography was performed with an 8 MHz convex transducer. The mass was round and well demarked but had an inhomogenous cystic parenchyma (fig. 3). The liver was normal and seemed to have no contact to the mass. The final diagnosis was abdominal tumor, possibly originating from the ovaries, the spleen or kidneys.

Because of the poor prognosis the fish was euthanized. For scientific interest the Oscar underwent CT in right recumbency with 2 mm thick contagious slices. Dorsal plane images were performed and transverse and sagittal planes were reconstructed. The tumor appeared slightly inhomogenous and hypoattenuating. The compression of the swimbladder was again seen. There was no detectable connection to the liver (fig. 4). The liver measured 36 to 56 HU, the tumor 12 to 30 HU. At the level of the caudal end of the swimbladder, a small band of tissue was connected to the region of the kidneys ventral to the caudal vertebral column (fig. 4 to 6). The main final CT diagnosis was renal neoplasia.

At necropsy, the coelomic mass appeared as a large greyish-brown tumor originating with a peduncle from the caudal part of the caudal kidney. It was well defined, had expansive growth (5,5 x 6 cm) and weighed 57 gram. In cross section the sonographically diagnosed polycystic structure was apparent. The cyst cavities contained water-like odorless fluid. All other internal organs appeared normal.

Histologically the tumor was characterized by papillary-cystic growth of epithelial tissue (fig. 7). The epithelial cells were columnar to cuboidal and had eosinophilic cytoplasm. The nuclei were round to oval and were central to basal in location. The apical border of the epithelial

cells was bounded by microvilli and cilia. Several aggregates of macrophages with foamy cytoplasm were visible in the well developed stroma of the tumor. The cysts were filled with eosinophilic fluid and several radial or fungiform or envelope-like crystals. The tumor had been growing expansively with no signs of infiltration of the surrounding tissue. There was only moderate cellular and nuclear pleomorphism and the number of mitotic figures was small. The morphologic diagnosis was papillary-cystic adenoma of the kidney.

Discussion:

It was impossible to verify the origin of the coelomic mass radiographically. Enlargement of the kidneys would typically cause compression of the swimbladder from dorsal whereas the pedicle attachment resulted in atypical compression from caudoventral. Sonographically the tissue appeared inhomogenous and tumor-like. The position in the caudal coelomic cavity and absent contact with the liver led to the conclusion that the ovaries, spleen or kidneys were likely to be the origin of this parenchymatous tumor.

The diagnosis made by CT was supported by the results of the histologic examination. The tumor cells resembled the cells of the proximal convoluted tubules of the kidney. Particularly, the presence of microvilli and cilia identified the proximal tubules as the source of the tumor, because the cells of the distal tubules and the collecting ducts lack these structures [23,24].

Renal neoplasmas are rare in fish and therefore mainly described as solitary reports [25-30]. Nephroblastomas are the most common renal neoplasmas [27-29]. Trout and other commercially bred fish more often suffer from this tumor idiopathically. Furthermore, cystadenomas of the distal tubules and ductus mesonephricus may be caused by carcinogenic substances in trout [29]. Spontaneous renal cystadenomas in Red Oscars were described only four times in the USA [25,30]. A genetic disposition for renal cystadenomas in Red Oscars may be assumed because of the lack of comparable neoplasmas in any other fish species.

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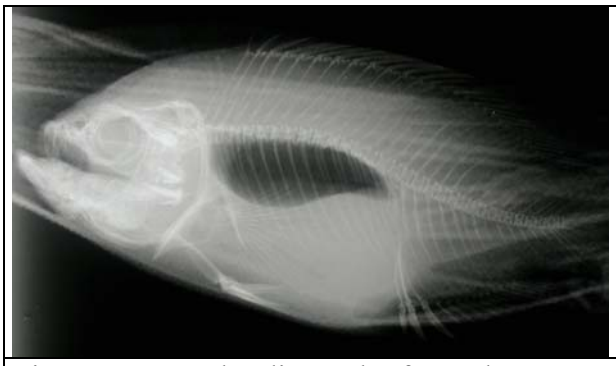


Figure 1: Lateral radiograph of a Red Oscar with abdominal swelling: for proper handling the fish is wrapped in a towel. There are some longitudinal opacities caused by the towel that did not hinder the diagnosis of an abdominal mass defect.

Figure 2: Dorso-ventral radiograph of a Red Oscar with abdominal swelling (compare Fig. 1). The mass appears as a smooth bulging at the right abdominal wall.

Figure 3: Ultrasonography of an abdominal mass of an oscar: a well demarked round inhomogenous mass with mottled and cystic parenchyma is located in the middle and caudal coelomic cavity.

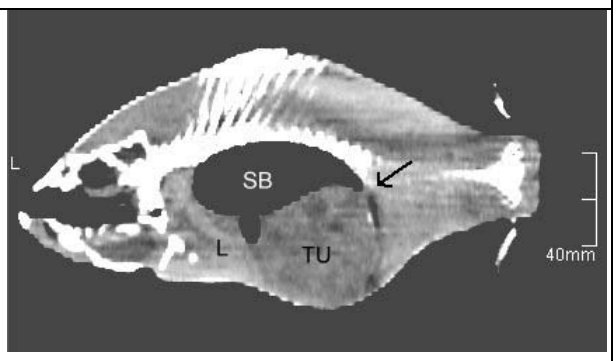
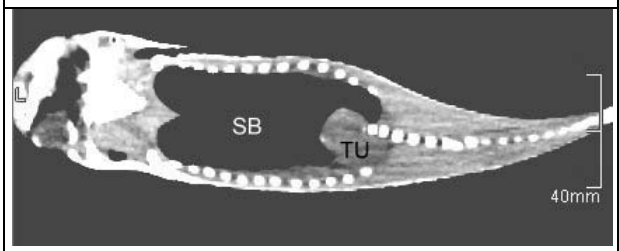


Figure 4: Reconstructed slightly right paramedian sagittal CT image of a Red Oscar: the mass (TU) appears well defined, slightly inhomogenous and hypoattenuating in this soft tissue window and compresses the swimbladder (SB) from caudoventral. The tumor has no significant connection with the liver (L) but with the tissue ventral to the vertebral column (black arrow). The kidneys cannot be discerned.



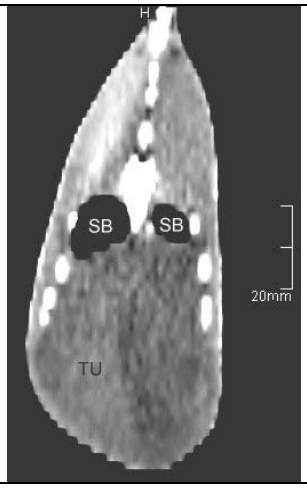


Figure 5: Dorsal plane CT image of a Red Oscar: the mass (TU) is located immediately ventral to the vertebral column and compresses the swimbladder (SB) from caudal. The kidneys cannot be discerned.	Figure 6: Reconstructed transverse CT image of a Red Oscar at the caudal end of the swimbladder: the mass (TU) appears well defined, slightly inhomogenous and hypoattenuating in this soft tissue window. It seperates the swimbladder (SB) and fuses with the tissue ventral to the vertebral column. The kidneys cannot be discerned.

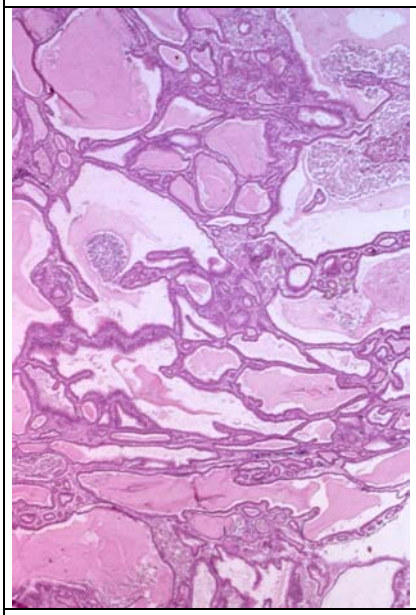



Figure 7: Histological aspect of the tumor of the Red Oscar. Papillary cystic epithelial neoplasm, the cystic spaces are filled with eosinophilic fluid. HE-stain, x10	