Ultrasonic and Endoscopic Examination of Lower Missouri and Lower Mississippi Pallid Sturgeon to Determine Sex and 2006 Broodstock Potential

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Summary Report to:

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Contents

Reproductive Assessment

Ultrasonic and endoscopic examination of Missouri River sturgeons has been shown effective for sex and reproductive stage determination (Wildhaber et al., 2005; Bryan et al., in press; Wildhaber et al., in press). In the application of both methodologies, sturgeon are inverted and submerged in water (Fig. 1 and 2). Sturgeon are docile enough in the inverted position that anesthesiology is not needed. During ultrasonic examination the entire body cavity is scanned using the probe (Fig. 1). During endoscopic examination, the vent area is positioned out of the water and the probe is inserted into the gonoduct (Fig. 2). The gonoduct is similar in both sexes, starting from the urogenital pore it forks into two long tubes that run parallel to the gonads (Kynard and Kieffer, 2002). Ultrasound is used to determine female sturgeons and their reproductive stage based on the presence and size (i.e., large size means later stage), respectively, of oocytes and/or ovarian follicles in both the transverse and frontal plane views (Fig. 3; immature Stages 1 – 3, and 6). Also, ovigerous folds can often be seen in the frontal plane view of early reproductive stage females (Fig. 3). In ultrasonic images of mature male sturgeons taken from the transverse plane, testes are seen as distinct, paired oval structures (Fig. 4); in the frontal plane view they are seen as large tubular lobes (Fig. 4). The endoscope probe is primarily used to determine sex by documenting the presence, relative size, and color of oocytes and/or ovarian follicles through the gonoduct membrane. This information, in concert with information gained from the application of ultrasonic imaging, is used to determine sex and reproductive stage of sturgeons. Detailed methods can be found in Wildhaber et al. (2005), Bryan et al. (in press), and Wildhaber et al. (in press).

Figure 1. Ultrasonic examination of a pallid sturgeon.

Figure 2. Endoscopic examination of a pallid sturgeon.

In the spring of 2006, the U.S. Fish and Wildlife Service (USFWS) requested the researchers at the Columbia Environmental Research Center (CERC) apply the ultrasonic and endoscopic techniques they developed to determine the sex and the 2006 broodstock reproductive maturity of wild caught pallid sturgeon collected from the Lower Missouri and Lower Mississippi rivers and hatchery raised pallid sturgeon. We examined 34 pallid sturgeon

with a portable ultrasound and an endoscope. These fish consisted of: 20 wild pallid sturgeon collected from the Lower Missouri River, 3 wild pallid sturgeon collected from the Lower Mississippi River, and 11 hatchery raised pallid sturgeon from the 1992 propagation year class (Table 1). Of these fish, 14, 0, and 6 were immature (Table 1), respectively, as distinguished by the presence of small ovarian follicles and/or ovigerous folds (Figs. 5 and 6). Mature sturgeon included two females and four males from the Lower Missouri River, two females and one male from the Lower Mississippi River, and two females and three males in the 1992 propagation year class (Stage 4 or 5—Table 1). Maturity was distinguished by the presence of large follicles in females or lobed testes in males (Figs. 3 -5 and 7). The endoscopic view through the gonoduct of the 1992 year class showed maturing black follicles or black follicles with yellow centers (Fig. 5). Additionally, three females that were resorbing unspawned follicles from last year were distinguishable using the endoscope. Their ovaries contained multiple follicle sizes and colors (Fig. 6). Upon examination with the portable ultrasound, the digestive tract of the majority of the pallid sturgeon examined contained rainbow trout (*Oncorhynchus mykiss*) fed to them while in captivity (Fig. 8).

	Immature		Mature		
	Males	Females	Males	Females	Total
Wild Caught Lower Missouri River Fish	11	3	4	2	20
Wild Caught Lower Mississippi River Fish	0	0	1	2	3
1992 Propagation Year Class	2	4	3	2	11
Total	13	7	8	6	

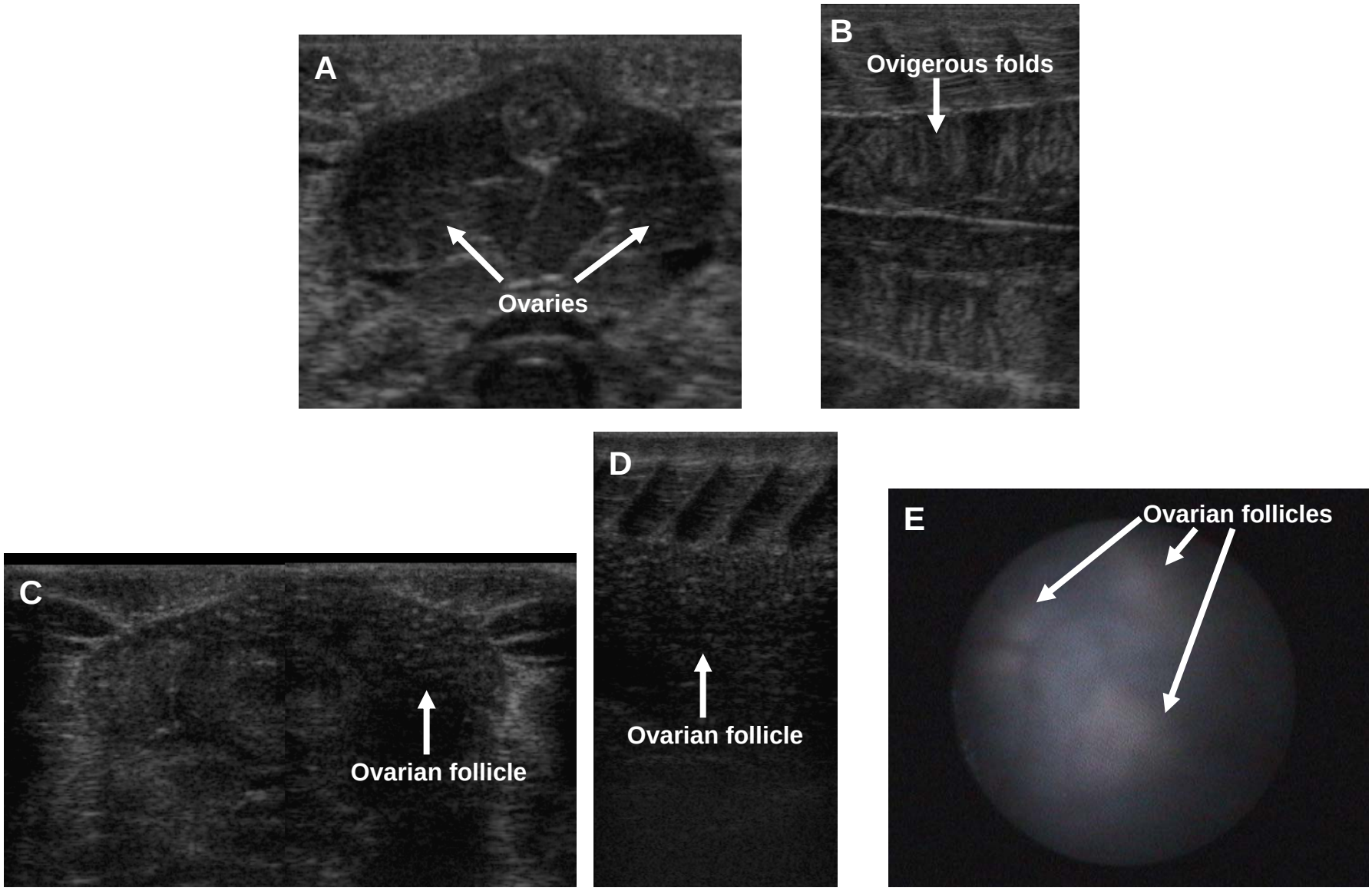

Figure 3. Ultrasonic transverse (A) and frontal (B) plane images from an immature female pallid sturgeon with ovarian folds (B) and ultrasonic (C, D) and endoscopic (E) images from an immature female pallid sturgeon with small ovarian follicles caught in the Lower Missouri River.

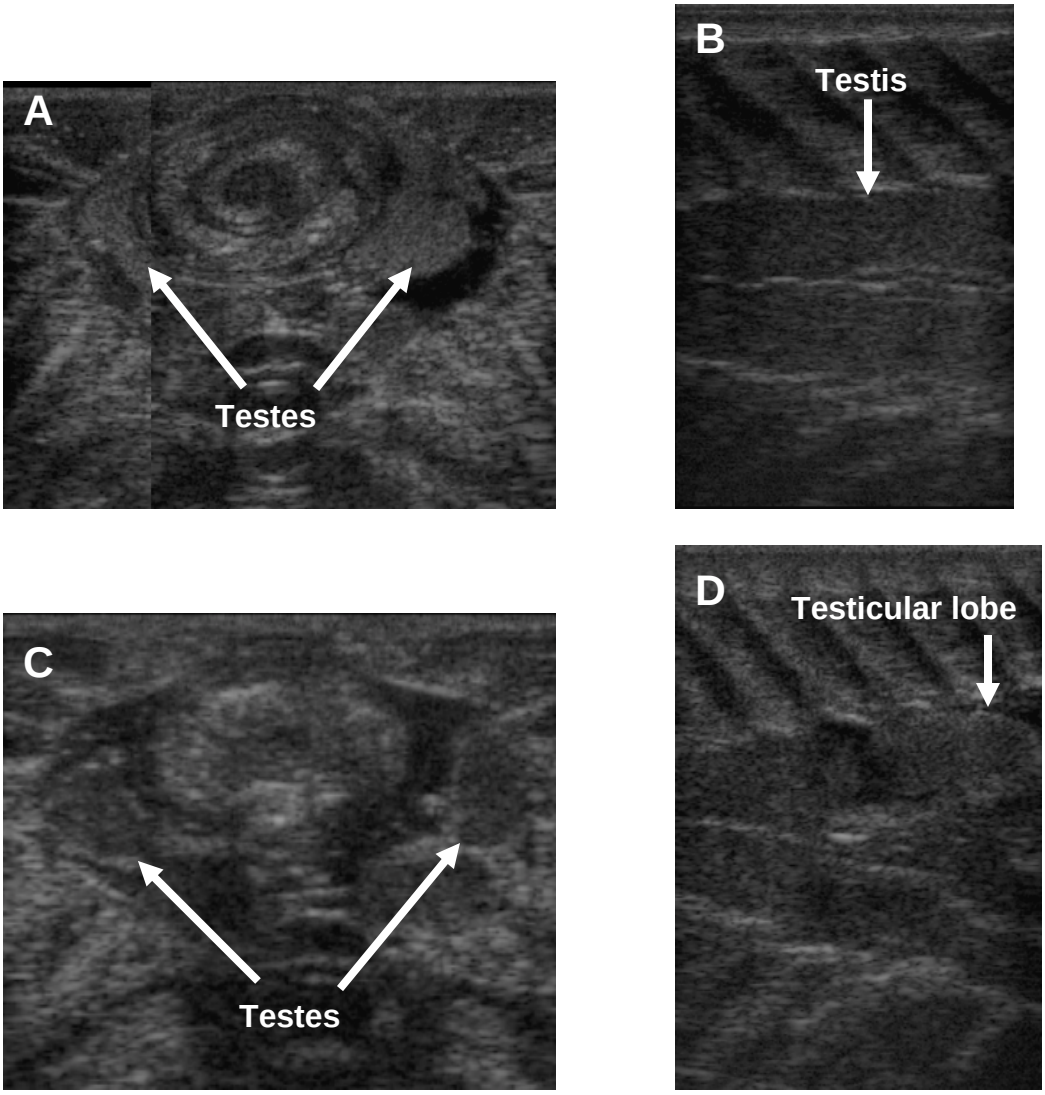

Figure 4. Ultrasonic transverse (A, C) and frontal (B, D) plane images from an immature male pallid sturgeon (A, B) and a mature male pallid sturgeon (C, D) with lobed testis caught in the Lower Missouri River.

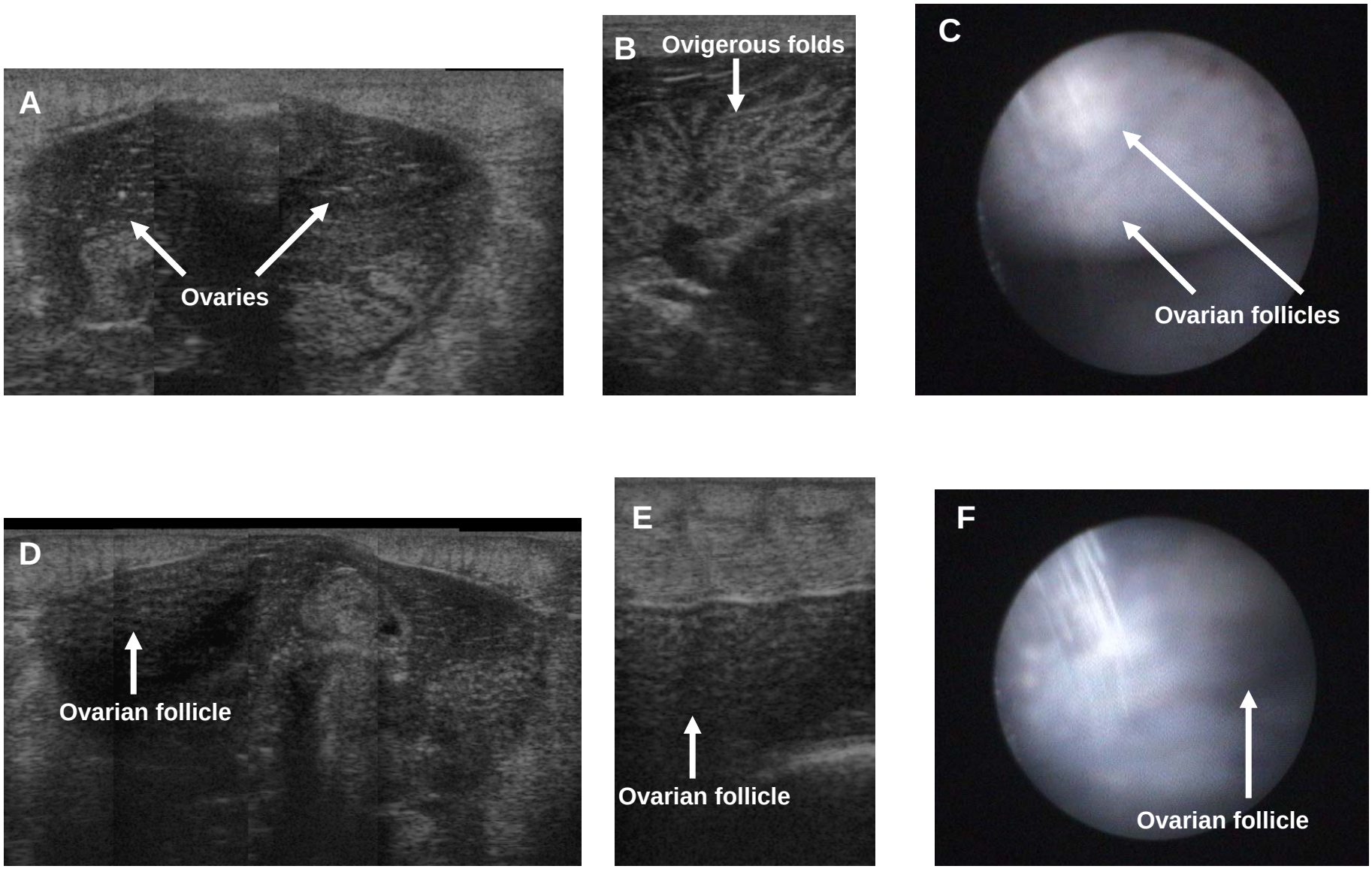

Figure 5. Ultrasonic transverse (A, D) and frontal (B, E) plane images and endoscopic (C, F) images from an immature female pallid sturgeon (A-C) with ovigerous folds (B) and a mature female pallid sturgeon (D-F) with large ovarian follicles (F) from the 1992 propagation year class.

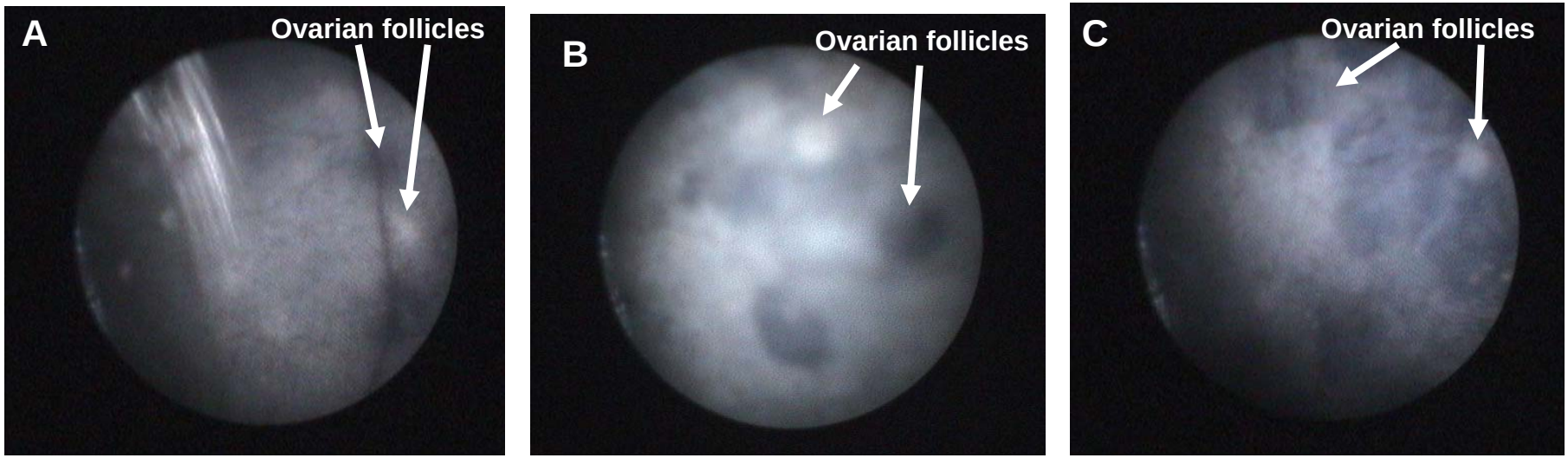

Figure 6. Endoscopic images from stage 2 female pallid sturgeon from the 1992 propagation year class indicated by the resorbed black ovarian follicles and the next set of white oocytes.

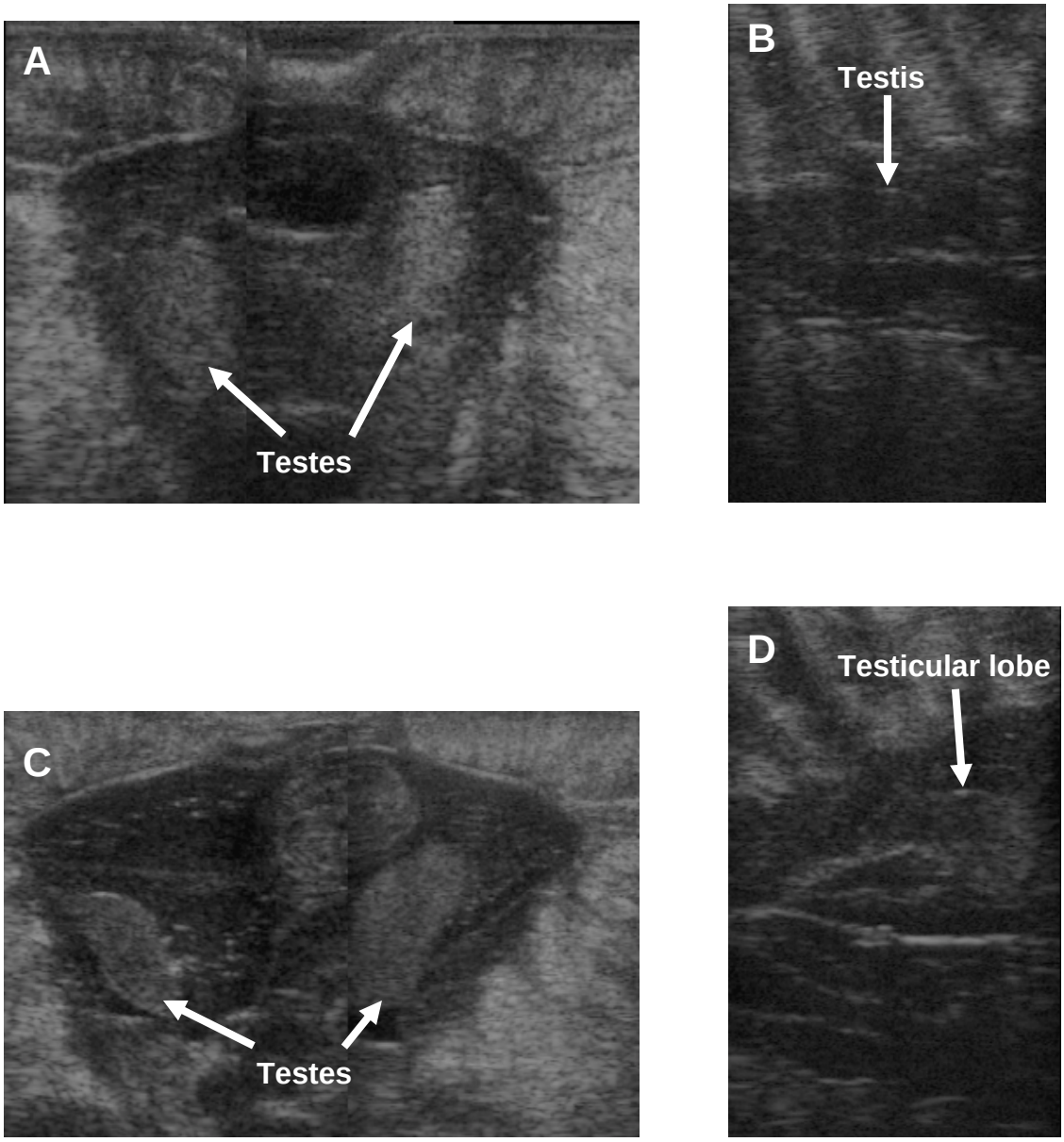

Figure 7. Ultrasonic transverse (A, C) and frontal (B, D) plane images from an immature male pallid sturgeon (A, B) and a mature male pallid sturgeon (C, D) with lobed testis from the 1992 propagation year class.

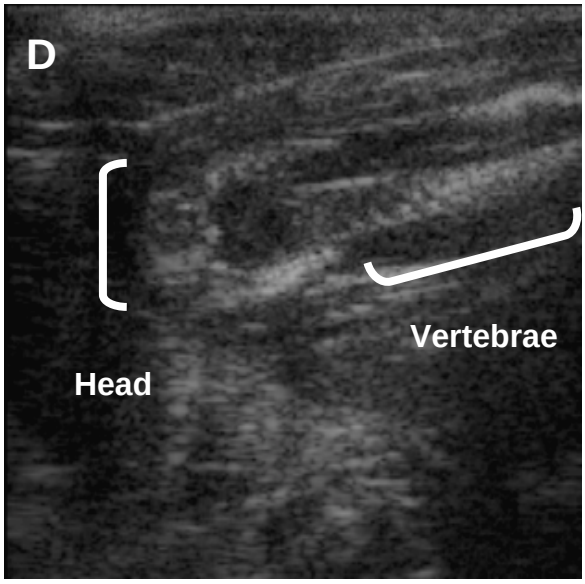

Figure 8. Ultrasonic transverse plane image from a mature male pallid sturgeon caught in the Lower Missouri River (fish #412c2f0f79) with a rainbow trout in the digestive tract. The head and vertebrae of the trout are visible in the image

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