COMPARISON OF TWO METHODS OF IMAGE ANALYSIS FOR THE EVALUATION OF SURFACE FIN

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ABSTRACT

The aim is to compare the program ImageJ measurement surface dorsal and caudal fins with tools POLYGON SELECTION and TRESHOLD + WAND (TRACING) TOOL. It was photographed 13 pieces of rainbow trout (*Oncorhynchus mykiss*) 180-253 mm TL with distributed dorsal and caudal fins on white paper. The demarcation of borders between the body and fins used program Paint.Net. Measurement of surface fins in ImageJ software tools POLYGON SELECTION and TRESHOLD + WAND (TRACING) TOOL. Among the data obtained from both tools there are no significant differences. They can be used for joint evaluation of condition fins.

Key words: fish, fin condition, ImageJ, treshold, polygon selection

Acknowledgments: Conditions optimization for salmonids intensive rearing in the Czech Republic using Danish technology with a focus on the quality of produced fish. (QI91C001). Technology of freshwater fish farming with using Danish type recirculation systems, with a focus on methods of effective environmental management and health care. (QJ1210013).

INTRODUCTION

Recently, there is a greater interest in the welfare of fish (North et al. 2006). Improving the state of welfare in farmed fish brings higher gain, improved feed conversion of nutrients and disease resistance (Boujard et al. 2002, Suomalainen et al. 2005). As an indicator of welfare state can use fin condition (North et al. 2006, Rasmusen et al. 2007, D'orbcastel et al. 2009). Most studies on the condition of fins are focused on rainbow trout. Worsened fin condition is distinguished by shortening of fins, frayed rays (Latremouille 2003), disruption of fin tissue, lesions and necrosis creation (Turnbull et al. 1998). Length of fin depends on the size of fish, stocking density and on rearing conditions (Wagner et al. 1996, Person-Le Ruyet et al. 2008). Fin erosion occurs only with the intensively reared fish (Bosakowski and Wagner 1994, Ellis et al. 2008). Fin erosions are caused by abrasion against tank surface and by physical contact with other fish, especially when feeding (Person-Le Ruyet et al. 2007, Turnbull et al. 2008, Adams et al. 2011), by inappropriate diet composition, feeding management (Latremouille 2003; Noble et al. 2008), thoughtless manipulation (Svobodová et al. 2007) and bacterial infections (Ellis et al. 2002, Latremouille 2003). A certain influence on fin condition has a stocking density, water quality (Person-Le Ruyet et al., 2008) and type of rearing facility (Moring 1982, Turnbull et al. 1998). Mostly damaged fins are dorsal and pectoral in salmonids (Turnbull et al. 1998, Rasmussen et al. 2007), subsequently anal, caudal and abdominal (Bosakowski and Wagner 1994). Fin condition is evaluated by computer image analysis. Various software is used, f.e. ImageJ (Drucker and Lauder 2003), Olympus MicroImage (Stejskal et al. 2011), AnalyzingDigitalImages (Yajing 2012).

The aim is to compare the program ImageJ measurement surface dorsal and caudal fins with tools POLYGON SELECTION and TRESHOLD + WAND (TRACING) TOOL.

MATERIAL AND METHODS

Thirteen of rainbow trout 180-253 mm TL were obtained from the recirculation system BioFish Company Ltd. in Pravíkov. Fish killed by hitting a metal mallet to the head. Dead fish placed on a tray with the attached measure. Fins distributed with tweezer on white paper. Photos taken with the camera Canon EOS 450D with Canon lens EF100/2.8 MACRO USM. To maintain the same distance from the camera lens a tripod was used. The camera was connected to a laptop Asus S96Jm and using of Digital Photo Professional (version 3.3.0.0) photos were taken. For each image were evaluated surface dorsal and caudal fins. The tool LINE / CURVE in the Paint.Net (version 3.5.11.) marked borders fins white line in a size 4 (Fig.1). Image analysis using the program ImageJ (version 1.46r). After opening each photo set was known distance (ANALYZE-SET SCALE) attaching lines (tools STRAIGHT) to measure the image to convert pixels per mm. The program ImageJ offers two ways of measuring surface objects:

POLYGON SELECTION tool is a hand tracing the outline of the fins and the mouse cursor measurement values by pressing the M key on the keyboard. THRESHOLD + WAND (TRACING) TOOL requires editing an image in 8-bit color depth. Created black and white photographs. THRESHOLD draws surface fins. Used measurement tool is WAND (TRACING) TOOL, which marks the borders drawn THRESHOLD (Fig.1). Pressing the M key to get the measured value (Lukáš et al. 2008).

Statistics were performed in Microsoft Office Excel 2010 and using a one-way ANOVA.

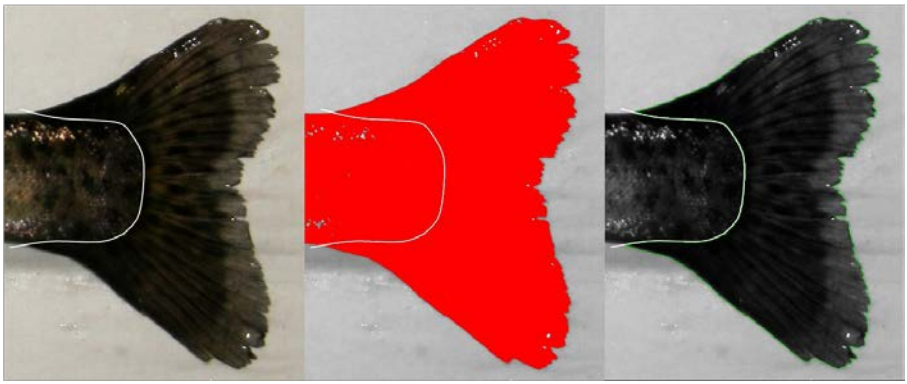

Fig. 1 The measurement procedure THRESHOLD + WAND (TRACING) TOOL on the caudal fin. On the left, the first image is demarcation of borders in Paint.net. The second image is drawing fins tool THRESHOLD and third marking outline WAND (TRACING) TOOL.

RESULT AND DISCUSSION

There were evaluated 13 dorsal and caudal fins. The results show no statistically significant difference ($p > 0.05$) between the two methods (Tab.1).

Tab. 1 The measured values for fins in mm^2.

Fin	Dorsal		Caudal	
Fish	POLYGON SELECTION	TRESHOLD+WAND (TRACING) TOOL	POLYGON SELECTION	TRESHOLD+WAND (TRACING) TOOL
1	510,42	510,6	672,57	674,64
2	309,03	313,6	1116,02	1116,61
3	759	759,85	1692,92	1693,86
4	559,55	559,46	1400,22	1399,97
5	550,98	540,58	1108,19	1110,9
6	591,07	594,12	1317,85	1314,12
7	330,46	333,39	1326,32	1331,79
8	352,89	354,2	629,4	633,69
9	524,41	530,67	1074,09	1078,72
10	488,24	491,74	876,63	882,79
11	90,17	91,51	834,87	833,05
12	361,36	363,75	989,46	994,79
13	202,52	203,64	743,54	746,09

Image analysis is suitable for the biometric measurement. It is characterized by less variability than manual measurements (Goodenough et al. 2012). POLYGON SELECTION requires more time to measure and higher number of clicks, for example to surface caudal fin is needed on average 177 clicks. It depends on the size, the degree of damage and frayed fins. Measurement using THRESHOLD + WAND (TRACING) TOOL is faster, about 90% less mouse clicks (to get surface

caudal fin is needed on average 18 clicks), but requires a good photo without reflection. The measured object must be darker than the background attached. It is not affected by the subjective impression of the person performing image analysis.

CONCLUSIONS

Measurement of surface fins in ImageJ using the tools POLYGON SELECTION and THRESHOLD + WAND (TRACING) TOOL are equal. They can be used for joint analysis of the fin condition.

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