COM of the prey. The accuracy index (*AI*) was defined as *AI*=1–(distance to prey/distance to volume boundary) such that higher values of *AI* indicate the prey item was closer to the COP. Values of 1 indicate the prey is located at the COP (i.e. the value within the parentheses above would be zero). If the prey were located on the boundary of the ingested volume, the *AI* would equal zero (i.e. the value within the parentheses above would be one).

In addition to this overall metric of accuracy, we measured the vertical (relative to the *x*-axis) and the horizontal (relative to the *y*-axis) accuracies for each strike (Fig. 1). We first calculated the distance between the COM of the prey item and either the *x*-axis (A_y) or the y-axis (A_x) (Fig. 1). We then calculated the straight-line distance from the boundary of the ingested parcel of water to the axis of interest (going through the COM of the prey). The accuracy relative to the axis of interest was defined as $A_{x \text{ or } y}$=1–(distance to prey from axis/ distance to boundary from axis). Values of 1 indicate the prey item is located on the axis of interest and values of zero indicate that the prey is located on the boundary of the ingested parcel of water.

Maximum fluid speed, measured at a distance of ½ of maximum gape away from the center of the mouth, was quantified for a large number (96) of sequences for bluegill sunfish and largemouth bass. The purpose of this was to determine the average maximum fluid speed for each species under a variety of feeding situations.

In a separate analysis to characterize maximum suction feeding performance, we selected the maximum value for fluid speed and fluid acceleration for each individual using fluid speeds in the earthbound and fish's frames of reference. The acceleration we are measuring is the local acceleration of the fluid since our measurements are at a single location. Thus, acceleration in our study refers to the local acceleration of the fluid. We also selected the maximum value for d*V*/d*t*, which was only calculated in the fish's frame of reference. The local acceleration of the fluid in the earthbound frame of reference was calculated by dividing the maximum fluid speed by the time to peak fluid speed (*TTPFS*), which is the time from 20% of peak gape to the time of maximum fluid speed. To calculate local fluid acceleration in the fish's frame of reference, we added the average ram speed of the strike to the maximum fluid speed and then divided this by *TTPFS*. To characterize the accuracy for the maximum performance strikes, we first selected the three sequences per individual that exhibited the highest fluid speeds. For each individual, we then averaged the three values of accuracy for these strikes.

Statistical analyses

Prior to performing any statistical analyses, we $\log_{10}$ transformed all of the variables (with the exception of the accuracy index) in order to normalize variances. For the accuracy index, we used an arcsin transformation. For each species separately, we performed mixed-model multiple regressions in order to determine the effects of *TTPG*, ram speed and maximum gape on the following dependent variables: (1) total volume of ingested water, (2) maximum rate of volume flow (d*V*/d*t*), and (3) the accuracy index (*AI*). We performed analyses of variance (ANOVAs) in order to determine the effects of species on several variables. For these analyses, the independent variables were species (fixed) and individual (nested within species; random). In order to correct for multiple statistical tests, α (0.05) was adjusted using a sequential Bonferroni test (Rice, 1989). We used SYSTAT version 9 (SPSS Inc., Chicago, IL, USA) for all statistical analyses.

Results

A detailed description of the hydrodynamics during suction feeding in bluegill has been presented elsewhere (Day et al., 2005; Higham et al., 2005a). Largemouth bass had an average maximum gape twice that of bluegill sunfish (Table 1). The average swimming velocity at the time of prey capture was substantially higher in largemouth bass than bluegill sunfish (Table 1). The average time to peak gape (*TTPG*), however,

Table 1. *Mean values for several variables examined in this study*

Variable	Largemouth bass	Bluegill sunfish	*P* value
Maximum gape (cm)	2.6±0.1	1.3±0.1	<0.0001*
TTPG (ms)	22.4±1.4	28.3±3.2	0.70
Ram speed (cm s^{-1})	48.0±5.7	8.1±2.0	<0.0001*
Ingested volume (cm^3)	27.8±3.3	4.5±0.5	<0.0001*
Accuracy index (*AI*)	0.46±0.03	0.80±0.02	<0.0001*
Height–length ratio of ingested volume	1.01±0.04	1.09±0.04	0.47
Average maximum d*V*/d*t* ($cm^3\ s^{-1}$)	1389.2±133	214.5±40.4	<0.0001*
Average *EFS* (cm s^{-1})	31.7±1.1	38.4±2.8	0.005*
Average *FFS* (cm s^{-1})	83.3±3.5	46.5±3.4	<0.0001*

TTPG, time to peak gape; *EFS*, fluid speed at a distance of ½ maximum mouth diameter in the earthbound frame; *FFS*, fluid speed in the fish's frame; d*V*/d*t*, change in volume per unit time.

Values are means ± s.e.m. The *P* values reflect the results of ANOVAs performed separately on each variable with species as the independent variable. *Significant (α=0.05) following a sequential Bonferroni correction.