CREATION OF A BODY SCORING CHART FOR NILE CROCODILE (*CROCODYLUS NILOTICUS*) AND ITS USE WITH BODY WEIGHT AND LENGTH TO ESTABLISH IDEAL WEIGHT RANGES FOR CROCODILES AT DISNEY'S ANIMAL KINGDOM®

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Abstract

Disney's Animal Kingdom® currently houses a bachelor group of eighteen Nile crocodiles (*Crocodylus niloticus*). Routine exams are conducted annually, at which time measurements of body length, weight, and body condition score for each crocodile are recorded. Body condition scoring has been used as an effective tool to monitor animal wellness and is utilized regularly with other species in the area. Until recently, the body condition scores assigned to the crocodiles were based on non-published guidelines and lacked consistency across users. In 2017, a project was undertaken to create a descriptive body condition score chart for the Nile Crocodiles at Disney's Animal Kingdom®. Data from the group over the past 10 years was used to create the body scoring guidelines as well as target weight ranges based on animal length. A five-point scale, based on the evaluation of six body areas including the head, neck, forelimbs, torso (ribs and spine), hind limbs, and tail was created. Within these categories, the chart identifies anatomical features to evaluate in order to assign body condition scores. The now standardized guidelines allowed for more consistency within users. Body condition scores were correlated with the biometrics of body weight and length such that the user can predict body weight using the length and body condition score which may be useful in situations where animals cannot be weighed regularly. Species specific notations have been added to the Nile crocodile body scoring chart which may help with the development of a similar resource for other crocodilian species.

Acknowledgements

The author would like to recognize a number of people for their assistance in the creation of this resource – The entire Ituri Forest Animal Care team including Buck Lyman, Scott Krug, Ike Leonard, and Kristen Wolfe; Eduardo Valdes and Shannon Livingston from the Animal Nutrition Team, and Austin Leeds, Alex Riley, Gina Ferrie, and Andrew Alba from the Science and Research Team.

Crocodilian BCS Chart

Developed at Disney's Animal Kingdom® in 2020 by Megan Terry

Score	Condition	Head	Neck	Forelimbs	Ribs and Spine (Torso)	Hindlimbs	Tail	Overall/Other	
1	Emaciated	Eyes sunken and may be partially closed. Palpebral bone may be prominent. Foramen sunken. Mandibular joint and cranial table very prominent. Nares pad maybe sunken in.	Spine very prominent. Nuchal cluster lower than cranial table and curves around spine.	Shoulders and limb bones very prominent. No fat and very little muscle on limbs. Area behind limbs is sunken. Skin may appear stretched taut from arm totorso.	Individual ribs may be visible. There is no fat and little to no muscle tissue seen or felt. Spine isvery prominent along entire lengthof the body. Back most likely dips between shoulders and hips.	Hips and limb bones very prominent. No fat and verylittle muscle on limbs. Areabehind limbs is sunken. Skin may appear stretchedtaut from leg to tail base.	Tailbase/area behind back legs sinks in. Tail is much narrower in width than body. the posterior portion of the tail may lay on its side. Area between double caudal scutes sinks in obviously. Spine may be visible.	Skin may look dry, thin, and papery. Caudal scutesmay appear weak and may appear to sag or droop. Body posture may appear exhausted or weak, skin islackluster, eyes are dull and unfocused	Thin
2 (1.5)	Very Thin	Eyes may be sunken and partially closed with palpebral obvious. Foramen dip in. Manibular joint and cranial table are sharp, angular, and prominent.	Nuchal cluster is lower thancranial table. Spine is easily seen and nuchal cluster hugs shape of spine.	Shoulders prominent. Somemuscle visible on limbs with no fat. Limbs are stillthin, and bones are easily visible and may be prominent. Area behind limbs is sunken.	Individual ribs may not be visible, but the ribs area is obvious. Some muscle present with no fat. Spine isless emphasized but still easily seen along the length of the body. Back may dip between shouldersand hips.	Hips prominent. Some muscle visible on limbs with little to no fat. Limbs are still thin, and bones are easily visible and may be prominent. Area behindlimbs is sunken.	Tail is more narrow than the body but muscle is present and little to no fat. Tail base sinks in behind legs. Area between double caudalscutes appears thin, spine may be visible.		
3 (2)	Thin	Mandibular joint and cranial table are easily seen. No jowls present. Foramendip in but are shallow	Nuchal cluster is slightly lower than cranial table. Spinal ridge may be seen but is not prominent.	Arms are thin but bones are not easily seen; presence of muscle and little fat. Area in front of and behind limbs is sunken.	Spine may appear as ridge that runsalong body but is not prominent. Back my dip between shoulders and hips. Ribs and rib cage are noteasily visible. Muscle is present with little fat.	Legs are thin but bones are not easily seen, presence ofmuscle and little fat. Area in front of and behind limbs is sunken.	Tail is more narrow in width than the body with more muscle present and some fat. Area behind legs may be slightly concave.		
4 (2.5)	Slightly Thin	Head is slightly angular. Foramen are visible but shallow. Jowls are not full but the area is slightly fleshy.	Nuchal cluster may be slightly lower than cranial table. Spinal ridge may be seen	Limbs are thin but bones not visible, presence of muscles and little fat. Areain front and behind limbs is slightly sunken	Spine is not easily visible but maydip between shoulders and hips. Ribs and rib cage are not easily visible. Muscles is present with some fat.	Limbs are thin but bones not visible, presence of muscles and little fat. Areain front and behind limbs is slightly sunken	Tail is narrow in width, with muscle present but little fat	Body is streamlined and may appear "just under" ideal	Ideal
5 (3)	Moderate	Mandibular joint is not visible. End of the cranial table is visible but neitherprominent nor angular (except for species with prominent squamosals such as *C. rhombifer).* Jowls may be slightly ormoderately present depending on species. Foramen visible but not obvious.	Neck blends smoothly into body. Nuchal cluster is in line with the cranial table or slightly lower. Spine not visible.	Shoulders and limb bones are not visible. Area behindlimbs is neither sunken norfull. Limbs are full but not fleshy. No fat is present around wrist or on fingers	Back is even and spine is not visible. Area over ribs is smooth and is covered with adequate muscle and some fat. Stomach does not protrude farther thanthe elbows/knees when on land	Hip and leg bones are not visible. Area behind limbs is neither sunken nor full. Limbs are full but not fleshy. No fat is present around wrist or on fingers	Tail is more narrow than the body but is full. The area between the double caudal scutes is flat and full.	Caudal scutes are erect and stiff (healthy). Body posture is aware. Eyes are focused and attentive.	
6 (3.5)	Slightly Fleshy	Jowls may be full, the fat pad at the end of the mouthmay become slightly more visible at this stage and bottom jaw is slightly fleshy. Foramen areshallow.	Nuchal cluster is in line with cranial table. Spinenot visible.	No dip behind forelimbs, limbs are full and slightlyfleshy, fingers may be slightly fleshy, shoulder bones not visible	Torso is full and may pancake out slightly. Adequate muscle and moderate fat is present. The back may bulge upward a bit.	no dip in front of hindlimbs, limbs are full and slightly fleshy, fingersmay be slightly fleshy, hips bones not visible	Tail is slightly more narrow than the body but isfull. The area between the double caudal scutes is flat and full.		
7 (4)	Fat	Jowls full, fat pad present at end of mouth and bottom jaw is fleshy. Foramen are very shallow.	Nuchal cluster may be raised slightly above cranial table. Spine not visible.	May have some fat behindarms, limbs are full and fleshy, fingers may be fleshy. Shoulders not visible.	Torso is full and there is fat accumulation in lower torso in front of legs. Belly pancakes out when resting on land. Back bulgesupward a bit.	no dip in front of hindlimbs, limbs are full and fleshy, fingers may be fleshy, hips bones not visible	Tail bulges out after the legs. Shallow ridge runs length of tail and space between double caudal scutes may bulge upward slightly		Overweight
8 (4.5)	Very Fat	Jowls very present, fat pad present at end of mouth and bottom jaw is fleshy. Foramen are very shallowto not visible.	Nuchal cluster may be raised slightly above cranial table. Spine not visible.	Fat pads present behind arms, limbs are full and very fleshy, fingers are fleshy. Shoulders are not visible.	Torso is very full and there is fat accumulation in lower torso in front of legs. Belly pancakes out when resting on land. Back bulgesupward noticeably.	Legs are full and very fleshy, fingers are fleshy, hips are not visible	Tail bulges out after the legs. Ridge runs length of tail and space between double caudal scutes bulges upward		
9 (5)	Obese	Jowls grossly present, pad of fat present at end of mouth and bottom jaw very fleshy. Foramen may be barely visible to not visible.	Nuchal cluster and neck may bulge above the cranial table. Spine not visible.	Fat pads present behind arms, limbs may be grosslyfleshy, fingers are fleshy. Shoulders are not visible.	Excessive to morbid amount of fat tissue present on torso with fat accumulation in lower abdomen infront of legs. Belly may pancake out when on land but may also keep a round shape. Torso appearsas a full bulge in water. Scales and scutes may appear stretched apart. Back bulges upward and/or mayappear as a "tabletop" with very little proper definition of curvature of torso/rib cage.	Legs may be grossly fleshy, fingers are fleshy, hips are not visible	Tail bulges out after the legs. Ridge runs length of tail and space between double caudal scutes bulges upward	Similar to a 1.0, especially depending on nutrition and quality of food.	
		Head	Neck	Forelimbs	Ribs and Spine	Hindlimbs	Tail		

A note on variations in species- Most crocodilians are very much alike in body shape with some subtle differences in some species. Black caiman have a more visible spine than other crocodilians. Larger crocodilians tend to have larger bellies than most, particularly in *ex situ* crocodilians. *Osteolaemus* and the two smooth-fronted caimans have large osteoderms that give them a rough appearance and their smaller size tends to make them look more bulky. Cuban crocodiles tend to look more streamlined and as a more active species, particularly with their high walk or run, they have a slender appearance. Large Mugger crocodiles, like American Alligators, have more present jowls than other crocodiles.