



Mandibular and Teeth Osteomorphology in Common Palm Civet (*Paradoxurus hermaphroditus*)

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Abstract

Common palm civet has another name “musang luwak” and is included in the Viverridae family. A civet is a small mammal that lives at night (nocturnal) and likes to eat fruit (frugivorous). The population of this animal is spread across Indonesia, Sri Lanka, India, and some South East Asia countries. Osteological studies on civets have not been done much. This study aims to determine the anatomical structure of the mandible and teeth macroscopically. This study used 3 civet craniums with an average body weight of around 2 kg obtained from Yogyakarta and Lampung. The samples separated from the muscles and tissues to obtain the cranium, mandible, and teeth. The cleaned samples were then put in 5.25% Sodium Hypochlorite for 24 hours to make the measurement easier. The next process is rinsing with running water and drying. Morphological studies were carried out by examining the teeth of the civet and comparing them with carnivores in the literature. Morphological craniomandibular data were observed specifically for the existing formations. In the mandible, there is a characteristic formation at the angle of the mandible which is tapered and the teeth are pyramidal in shape with the carnassial part which is a pair of pointed upper and lower teeth used for cutting food. The last two molars have a more sloping shape because they are closely related to the function of crushing bones. The dental formula in civets was formulated by incisivus (3), caninus (1), premolars (4), and molars (2) with a total of about 40 permanent teeth.

Keywords: Common Palm Civet, Craniomandibular; Gross anatomy; Osteo morphology, Teeth

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Introduction

Common palm civet has other names, namely caereuh bulan. His body is long and has short strong legs. Civets have hair that varies in color from light brown to grey around the body and darker on some spots (face, legs, and tail). The bright spot is under the eye, with a bright line on the head. Some species have longitudinal stripes on the dorsal body, Civet is a nocturnal animal that spends its entire day in tree holes or twigs, and can live in various habitats, both wilderness and around human habitation (Grzimek, 2004). Civets find food like mice, fruits such as mangoes, pineapples, melons, coffee, and bananas, and also eat insects and mollusks (Duckworth et al, 2008). Researches on the osteology of civets that has been carried out are

on the osteomorphology of the cranial extremity (Jadi, et al., 2019), femurs (Sinha, et al., 2017), anatomy of male reproductive organs (Novelina, et al., 2014), and brain (Amalo, et al., 2019). Wible and Spaulding (2013) describe in full the cranial osteology of the African Palm Civet. Research on the mandibular and teeth of civets has not been done and encourages researchers to research it. The diversity of the civet's diet different from other carnivorous types and its limited anatomical review prompted the author to research the anatomical structure of mandibular and teeth macroscopically (osteomorphology).

Materials and methods

The research was conducted at the Gross Anatomy Laboratory of the Faculty of Veterinary Medicine, Universitas Gadjah Mada (UGM) using samples of the civet cranium from the previous research with different topic. The frozen samples used in this study were 3 civets with the average body weight of 2.0 kg originally from Yogyakarta and Lampung (2 females and 1 male).

Identification of the civets has been carried out by the Laboratory of Animal Systematics, Faculty of Biology UGM. with No: BI/SH/36/V/2018. This research has obtained a Certificate of Ethical Clearance from the EC Commission of the Faculty of Veterinary Medicine UGM Number: 0016/EC-FKH/Int/2018. The chemicals used were Formalin 10% and Sodium Hypochlorite solution 5.25%. The equipment used included a scalpel, tweezers, scissors, gloves, a magnifying glass, and a digital camera. The samples were collected and stored in the freezer then prepared and cleaned from muscles and tissues. The samples were then put in 5.25% Sodium Hypochlorite for 24 hours until the bones were white to make it easier to find measurement points. The next process is rinsing with running water and drying. To speed up drying the cranium is heated in the sun. After that, the cranium was performed using an X-ray. The teeth were then prepared using a minor dental set and measurements were taken. Morphological analysis was carried out by observing the teeth. These observations were carried out to determine the characteristic formation of the teeth of civets and to compare them with other carnivores. A magnifying glass can be used in observations to make it easier to observe small parts.

Results and Discussions

Samples that have been processed until the bones are produced are then observed, measured, and radiological examinations are carried out on the mandible and teeth of the Civets (*Paradoxurus hermaphroditus*).

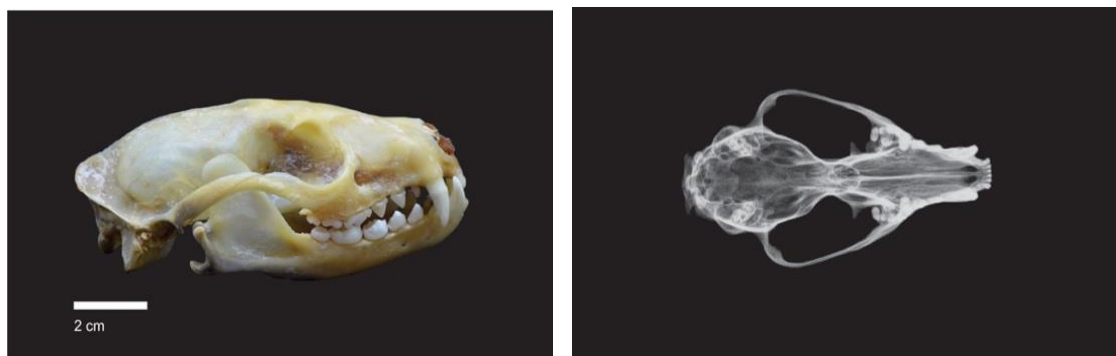


Figure 1. The cranium of civet dexter view and X-ray results ventral view (without mandible)

Cranium family Viverridae has a rostrum that is not short and tends to be tapered (Ewer, 1973), and civets have a tapered and long rostrum. Of the several types of carnivores, the civet belongs to the Feliformia (cat-like Carnivora) category based on differences in the structure of its auditory bulla either by a definite groove or by the depression of the tympanic bone in front of the swollen entotympanic (Berkovitz and Shellis, 2018). The craniomandibular morphology in this civet specializes in biting prey and breaking the hard skin.

Mandible

The mandible is the largest bony part of the skull and it also fits in most animals, such as cattle, camels, and tigers. The mandible consists of a single bone that is two parts that connect at the intermandibular symphysis (the connection at the cranial part) (Suri, et al., 2018), as has been seen in the civet (Figures 2 and 3).

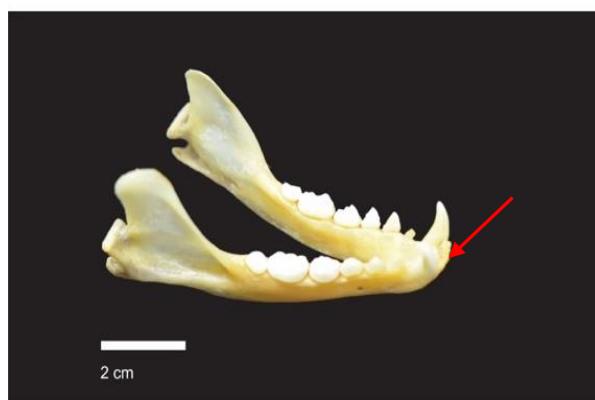


Figure 2. Mandible of the Civet. The intermandibular symphysis showed with a red arrow.

The intermandibular symphysis is also rough and uneven. The characteristic part of the mandible of some carnivores, including the civet, is the formation at the angle of the mandible which is tapered, bent, and not sloping (Suri, et al., 2018).

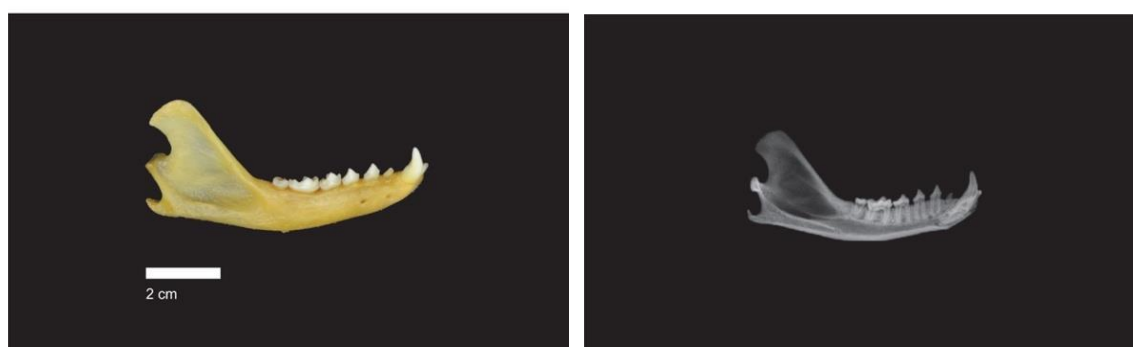


Figure 3. The mandible of Civet has been separated (part dexter) and X-ray results

Teeth

Based on the calculation of the number of sample teeth (Table 1), the number of teeth obtained is the same as the calculation by Ewer (1973) with a total of about 36-40 pieces consisting of

incisors, canines, premolars, and molars. The incisors have the smallest size when compared to the size of the other teeth, where the incisors in the maxilla develop larger than in the mandible. Most carnivores have canines that are used to catch their prey (Berkovitz and Shellis, 2018). Premolars are large with sharp carnassials. The maxillary tritubercular molars are wider than they are long, and the mandibular molars have well-developed talonids and varied eating habits (Ewer, 1973).

Table 1. The number of Teeth in Common Palm Civet

Samples	I	C	P	M	Total
Civet 1	12	4	16	8	40
Civet 2	12	4	16	8	40
Civet 3	12	4	16	8	40

*I=incisivus, C=caninus, P=Premolar, M=molar

This is in line with what was stated by Valkenburgh and Wayne (2010) that carnivores have a pair of teeth for cutting in their jaws called carnassials. The two teeth are the maxillary fourth premolars and mandibular first molars, which act together to cut the skin, tendons, and flesh. The teeth are more blunt ends which serve to soften the tissue and crush the bone in the food. In civets, because it includes eating fruit (frugivorous) (Laura, et al., 2014) and is more likely to be able to eat everything, the teeth are more protruding and not as sharp as in cats (Christiansen, 2008).



Figure 4. Teeth of the Civet dexter section for mandible and maxilla (From sinister to dexter, Incisivus (3), Caninus(1), premolar(4), and molar(2)).

Conclusion

The osteomorphology of the mandible and teeth of the common palm civet (*Paradoxurus hermaphroditus*) has several features that are characterized and can be used as guidelines for studying osteology and documentation of conservation anatomy in Indonesia.

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