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Some Biological, Ecological and Behavioural Features of *Erinaceus Concolor* Martin, 1838 (Mammalia: Insectivora) in Turkey

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ABSTRACT

In this study, morphology, breeding, feeding and hibernation behaviours and some ecological features of eight *Erinaceus concolor* specimens collected from the Kütahya and Konya provinces were recorded during field and laboratory studies between 2000 and 2004. Food preferances of hedgehogs were determined. Body weight changes of a specimen, on and after hibernation period were presented in figures.

Key Words: Erinaceus concolor, bioecology, behaviour, Turkey

1. INTRODUCTION

Erinaceus concolor, the only species of Erinaceus genus belonging to the family of Erinaceidae from the order of Insectivores, is spread across Turkey [1-5]. A hedgehog feeds on insects and snakes and can even hunt poisonous snakes. Its diet involves the insects belonging to the genus of *Meloe* and *Lytta* with highly poisonous kantaridin. The hedgehog plays an important role in biological protection and in the preservation of the ecological balance. For example, 0.1 miligram of Kantaridin can kill 25 people while the same amount can kill only one hedgehog. They have a strong defense mechanism against poisons [6]. Nomadic people living in the southern regions of Turkey enjoy eating hedgehog meat [4].

The nocturnal animals also go to hibernate. The studies about this species involves the taxonomical features and distribution [1,2,3,5,7-10]. However, there is little information about their biology, ecology and behaviors. The purpose of this research is to explain some of the features of *Erinaceus concolor* related to breeding, feeding and hibernation.

2. MATERIAL and METHOD

In this research, a sample of eight hedgehogs collected in the provinces of Kütahya and Konya between the years of 2000 and 2004 and the records of laboratory observations made in the field about them were evaluated (Table 1).

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Table 1: The *Erinaceus concolor* sample collected from Kütahya and Konya.

Sample no	Age period	Province of collection	Period of observation
1 ? (dead)	Adult	Kütahya	-
2 ♀ (dead)	Adult	Kütahya	-
3 ♀	Adult	Kütahya	26 May - 01 July 2002
4 ♂	Adult	Kütahya	12 - 13 May 2002
5 ♂ (dead)	Adult	Kütahya	-
6 ?	?	Kütahya	26 May - 01 July 2002
7 ♀ (dead)	Adult	Kütahya	-
8 ♂	Adult	Konya	13 September 2000 – 18 April 2002

Hedgehogs hit by cars on the road were collected. Two live samples died in the laboratory (no: 4 and 8) and others (no: 3 and 6) were taken back to the natural environment after the observation. Only one allowed information about hibernation. The ages were determined according to teeth erosion, breasts and testicles and found that all of the samples represent an adult group.

The animals in the laboratory were sometimes observed together and sometimes separately. A cardboard house was built the for cubs to also allow their mothers to enter. Cotton and woolen fabrics that displayed the hibernation behavior were left in the cage for the animals and they were weighed weighed them every 30 months.

The hedgehogs were given animal-based foods and this diet was supplemented with dried fruits. Formula containing milk, eggs, flour, sugar and yogurt was sometimes added. The behavioral and ecological features were evaluated with the observations made for one hour daily in the laboratory and one whole day a week.

3. FINDINGS

The genus of Erinaceus is represented by only one species in Turkey.

3.1. *Erinaceus concolor* Martin, 1838

1838. *Erinaceus concolor* Martin, Proc. Zool. Soc. London, 57, 102 - 103.
Type locality : Trabzon Turkey.

3.1.1. Morphological features

The top of its body is covered with thorns that display striped colors. Head and forehead area is covered with hair instead of thorns. The color of this hair ranges from yellowish brown to blackish grey. The dorsal and lateral areas of the body are also covered with thorns (Figure 1). The longest thorn is measured 37 mm (sample 5). The tips of ears are round and do not get longer than the length of the thorns on the forehead. Its body has a wide stain starting from the neck and breast areas and reaches to the fourth pair of breasts and can be seen from the sides when they walk. In the ventral region, the areas outside the stain, and especially pubic areas, are covered with black to yellowish brown hair. On the tail exists the hair with colors ranging from black to yellowish color. When the animal walks, the thorns on the forehead lean forward and the ones in other areas lean backward.

Figure 1: An adult *Erinaceus concolor* (no: 3 ♂) individual.

The skin at the bottom of their feet are bare and covered with tubercles and their top is hairy. Front feet are larger than the rear ones. The front feet have two cushions one of which with two ankle cushions one of which is large and the other small. The rear feet have two cushions one of which with two lobs and one large ankle cushion (Figure 2).

a **b**

Figure2: An adult *Erinaceus concolor* (no: 7, ♀) ventral view (a) right front foot and (b) right rear foot.

The thorns taken from the top of forehead and from the dorsal areas are different in length and in striped colors. The forehead top's thorn tips are thinner, longer and more curved than those in the dorsal areas. This feature allows the thorn to strongly connect into the skin and the animal to position forward 45 degrees. These head top thorns provides the hedgehog with two important advantages. One is to counter against the charges that may come from the front when it is on the move. The second is to allow it to gather itself to become round and to cover lock up completely.

Erinaceus concolor's palate has nine carina, right under the ninth carina next to the pharynx, behind the tongue, exist five tubercles (Figure 3).

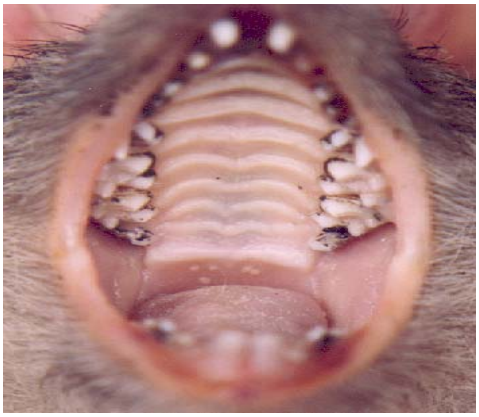


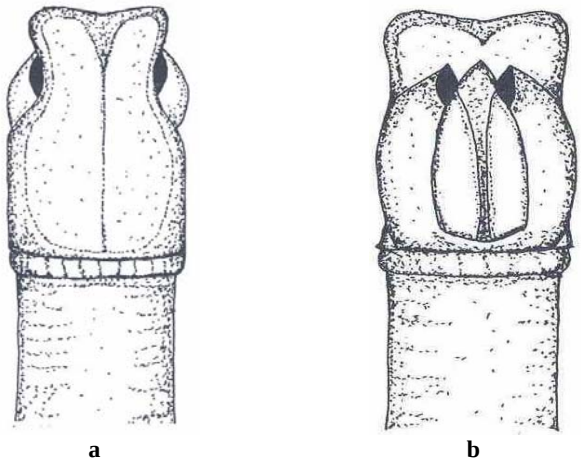
Figure 3: Adult *Erinaceus concolor*'s (no: 7, ♀) palate carinas and tubercles.

Skull length figures for three adult samples: Occipitonasal length 54,1 mm, condylabasal length 57,6 mm, basilar length 51,0 mm and nasal length 19,7 mm (Figure 4).

a **b**

Figure 4: An adult *Erinaceus concolor*'s (no: 5, ♂) (a) dorsal view and (b) lateral view.

Hedgehog phallus has a cylindrical shape and has different dorsal and ventral views (Figure 5). Of the sample (no: 2, ♂) coming out of hibernation and recorded on April 11, 2001, one testicle weighed 4 grams and its ratio to the body weight is 1/275.



a **b**

Figure 5: An adult *Erinaceus concolor*'s (no: 2, ♂) phallus (a) dorsal view and (b) ventral view.

3.1.2. Biological features

The hedgehog (sample no: 3) taken from the field gave birth to four cubs after eight days. When another sample whose sex could not be identified was put into the same room, it was observed that the mother was stressful and frequently fought with it. As a result of a fight, the mother lost her right eye and became injured under the chin. On June 5, 2002, an adult individual ate three of the cubs; the other one died three hours later because of the injury in its back. Both of the samples hopped 6 meters down from the balcony of the observation room and disappeared on June 5, 2002 (Table 2). The internal organs of an adult individual have been studied.

Table 2: An adult sample's (no: 4, ♀) weight measurements (g) and ratios to body weight.

Feature	Weight (g)	Ratio to body weight
Body	795	1
Lung	14	0,0176
Liver	27	0,0339
Kidney	11,5	0,0144
Heart	5	0,0062
Spleen	2,5	0,0031

3.1.3. Ecological features

The hedgehog lives in an environment such as the fruit gardens of apple, oleaster, pear and mulberry and the agricultural fields of vegetables, beet, spinach, corn and cabbage and thick grass areas around the barns and bushes. They can even sneak into urban areas. The two animals (no: 3 and 6) were caught in Kütahya on the same day at midnight. When the hedgehogs were shed spot lights in the field at night, they became afraid and rolled up and they did not try to escape.

When touched in nature or in the lab, they tended to "roll up" or to "jump". Sometimes they made the sound "flu, flu, flu". Ectoparasites such as ticks and fleas were found. The hedgehogs observed in the laboratory during the month of June were witnessed to frequently go in and out of their nests and did their toilet away from their nests. It was observed that they operated alone in the field. The individuals living in the laboratory came out of their nest after 8:30 pm and operated until around 5:00 am.

Considering the sexual features of animals, there is no difference in their diet. Accordingly, their favorite animal foods are found to be shrill pipe (*Scomberesox rendelatti*), anchovy (*Engrraulis encrasicholus*), grey mullet (*Mugil sp*.), garfish (*Belone belone*), carp (*Cyprinus carpio*), horse macherel (*Trachurus trachurus*) and chicken meat, from vegetable food, they like grape (*Vitis vinifera*), mulberry (*Morus alba*), strawberry (*Fragaria sp*.), apricot (*Prunus armeniaca*), plum (*Prunus sp*.), olive (*Olea sp*.) and peanut (*Arachis hypogea*). Beef, lamb or goat meat along with apple (*Malus sp*.) and fig (*Ficus carica*) are their secondary favorites. From artificial food, they prefer formula, cooked green and dry beans, meatballs, spaghetti, rice and honey as their primary favorite and crushed wheat and chocolate as secondary. Parsley (*Petroselinum sativum*) and tomatoes (*Lycopersicum esculentum*) are never eaten.

One animal caught on September 13, 2000 started to bring papers, cotton and wollen fabrics about a month later. On October 17, 2000 it began not to eat the food left in its nest. The nest hole of the hedgehog going to hibernation was observed every other day. It woke up on April 24, 2001 for the first time and began to walk around and ate the food left in its nest. After this date, its weight steadily increased (Figure 6). This hedgehog remained in the nest during the dates September 5 and 10, 2001 and did not eat the food left in the nest. It went out of the nest only once. The average temperature of the days the hedgehog did not go out (in Kütahya), was 12°C. The animal went to hibernation for the second time on September 27, 2001 and woke up on April 15, 2001. During its second hibernation period I weighed it on the fifteenth day of every month and recorded the changes in values (Figure 7).

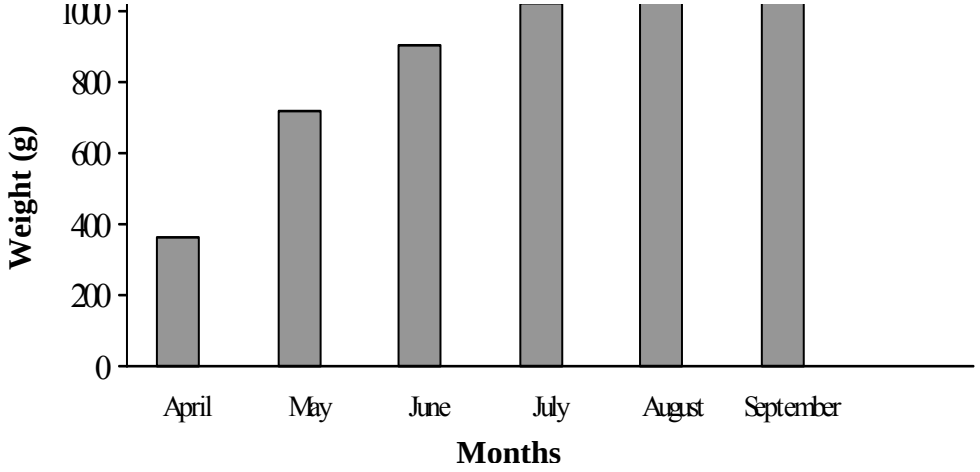


Figure 6: *Erinaceus concolor*'s (no: 8, ♂) weight measurements after hibernation.

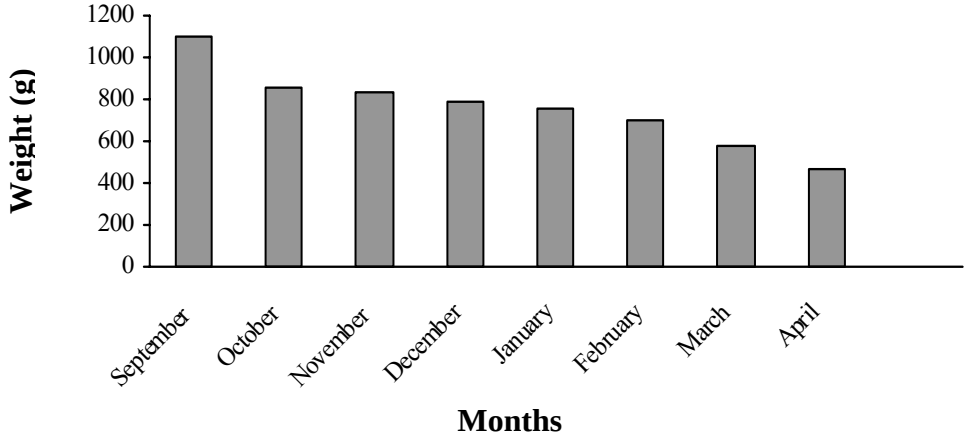


Figure 7: *Erinaceus concolor*'s (no: 8 ♂) weight measurements during hibernation.

The dates of hedgehog hibernation and waking up time in natural environments were determined from the dead hedgehogs hit by cars. During the four-year long research, it was found that the deaths occured during the months of April and October and observed that the hedgehogs began to die because of car crushes between the dates of April 6 to 12 and ended during the dates of September 3 to 15.

4. DISCUSSION and CONCLUSION

Doğramacı and Gündüz [2] explained that *Erinaceus concolor* always had a grayish white stain in breast area extending to the first inguinal udder and its top is covered with needles with striped colors that range from black to yellowish grey and the head and forehead without thorns and the ears are not longer than forehead thorns and ear tips are round and ear exteriors are bare and interiors are covered with yellowish grey hair and foot bottoms are filled with tubercles and bare [2]. In the research, it was discovered that our findings confirmed Doğramacı and Gündüz's [2] findings related to its analyzed morphological features. The hedgehog generally prefers fruit and vegetable gardens. Moreover, it can even sneak into city centers. Hirsch [4] explains that this species feeds on insects, snails and rats as well as various fruits. In laboratory observations the hedgehog eats beef, lamb, fish, goat meat and chicken meat along with vegetable food such as mulberry and strawberry and depends on water for its survival. The hedgehog gives birth in the first week of June. Under stress it eats its cubs or injures them. Kuru [6] states that these animals do not go out of their nest when the outside temperature is under 17 °C in summer. Our research determined that the average temperature of the days where the hedgehog did not go out was recorded as 12 °C. Its body weight doubled after it woke up from hibernation and it was a half of its last weight. The weight lost in the first month of hibernation was the highest among other months and equals 3/8 of its total weight loss. During hibernation, the average breathing rate was measured as 10 in December. Many kinds of

insects constitute a nutrition source for the hedgehog. Chemical destruction of insects, environmental pollution and ecological destructions threaten the livelihood of hedgehogs. It is easy to notice that the hedgehog constitutes an important loop in the food chain and plays an important role in the struggle against the insects.

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