

A Study on the Long-eared hedgehog, *Hemiechinus auritus* (Gmelin, 1770) (Mammalia: Insectivora) in Turkey

Ercüment ÇOLAK, Nuri YIĞIT, Mustafa SÖZEN
Department of Biology, Faculty of Science, University of Ankara Beşevler, Ankara-TURKEY
Şakir ÖZKURT
Department of Biology, Education Faculty of Kırşehir, University of Gazi, Kırşehir-TURKEY

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Abstract: Thirteen specimens of *Hemiechinus auritus* collected in Turkey were examined for external, cranial, karyological and phallic characteristics along with postnatal development. The karyotype of *H. auritus* has $2n = 48$ chromosomes, $NFa = 92$ and $NF = 96$. The X chromosome is a large metacentric and the Y chromosome is the smallest metacentric. There are two rows of spines on the dorsal of the glans penis. The pups were born with an average weight of 6.74 g, and they opened their eyes and ears 20 days after birth. Weaning took place on day 31.

Key Words: *Hemiechinus auritus*, Karyology, Mammalia, Turkey.

Türkiye'deki Uzun kulaklı kirpi, *Hemiechinus auritus* (Gmelin, 1770) (Mammalia: Insectivora) Üzerine Bir Çalışma

Özet: Türkiye'den toplanan onüç örnek doğum sonrası gelişme ile beraber dış, kafatası, karyolojik ve phallus karakterlerine göre incelendi. *H. auritus*'ün karyotipi $2n = 48$, $NFa = 92$ ve $NF = 96$ 'lık değerlere sahiptir. X kromozomu büyük metasentrik ve Y kromozomu en küçük metasentriktir. Glans penisin dorsal yüzeyinde iki sıra halinde dikensi yapılar vardır. Yavrular ortalama 6,74 gr. ağırlığında doğdular, gözleri ve kulakları 20 günde açıldı, süttten kesilme 31 günde vukubuldu.

Anahtar Sözcükler: *Hemiechinus auritus*, Karyoloji, Mammalia, Türkiye.

Introduction

Hemiechinus auritus is distributed in Libya, Egypt, Israel, Lebanon, Syria, Turkey, USSR, Iran, Afghanistan, Pakistan, Mongolia, China (1, 2, 3, 4, 5, 6, 7, 8, 9). The karyotype of this hedgehog was described from Daghستان (10), Egypt (11), Iraq (12), Afghanistan (13), India (14) but not from Turkey. Harrison and Bates (9) noted taxonomic problem between *H. auritus calligoni* and *H. auritus aegyptius*, on the basis of a single criterion for the distinction of two races. The aim of present study is to contribute to the taxonomy, the karyology and the distribution of *H. auritus* in Turkey.

Material and Methods

Thirteen specimens were collected at five localities (Aralık, 2; Ceylanpınar, 3; Harran, 5; Kilis, 1; and Nizip, 2) in Turkey and four karyotyped specimens were brought from southeastern Turkey. Karyotype preparations were made from the bone marrow of a colchicized animal (15) and 25 metaphase cells from each animal were examined. The phalli of live were measured both animals in the laboratory and in the field, and phalli were prepared using fresh material. Thirteen

measurements were taken from each skull using caliper, accurate to the nearest 0.1 mm (7, 9, 19). A reproductive study was performed on a female in captivity which gave birth to four pups. After parturition, the pups were inspected daily to note reproductive information. They were weighed and measured weekly. The animals were fed on milk, bread, meat, egg, carrot and worms.

Results

Hemiechinus auritus (Gmelin, 1770)

Type locality: Astrachan, southeastern Russia

Habitat: *H. auritus* lives in dry steppe areas in southeastern and eastern Turkey.

Measurements: The body and cranial measurements of *H. auritus* are listed in Table 1.

Distribution: *H. auritus* was recorded at five localities in Turkey (Fig. 1).

Diagnostic characters: Ears are large. The muzzle is pointed. Facial fur is yellowish white; underparts are dusty white. Tips of dorsal spines are white. The first upper incisors are proodont.

Characteristics (mm)	n	Mean	Range	SD
Total length	13	182.66	170-198	7.18
Tail	13	17.60	17-21	1.94
Hind foot	13	31.50	30-34	1.91
Ear	13	36.50	36-40	3.51
Weight (g)	13	17250	110-275	71.47
Zygomatic breadth	5	40.70	40-41.6	0.81
Condylobasal length	5	40.70	40-41.6	0.81
Interorbital constriction	6	10.83	10.3-11.4	0.44
Rostrum breadth	5	7.7	7.5-7.9	0.62
Postorbital breadth	4	13.2	12.9-13.6	0.58
Breadth of braincase	4	17.66	17-18.1	0.55
Palatal foamen	6	5.2	5.1-5.3	0.08
Nasal length	5	12.46	11.7-13.4	0.86
Height of skull	5	14.02	13.3-15.2	0.78
Mastoid breadth	3	15.85	15.6-16.1	0.35
Mandible length	13	29.9	28.9-30.8	0.95
Lower row of teeth	13	16.1	15.4-17.2	0.91
Upper row of teeth	13	18.24	16.7-20.6	1.48

Table 1. Body and cranial measurements of *H. auritus* in Turkey (\pm SD: Standard Deviation; n = number of specimens).

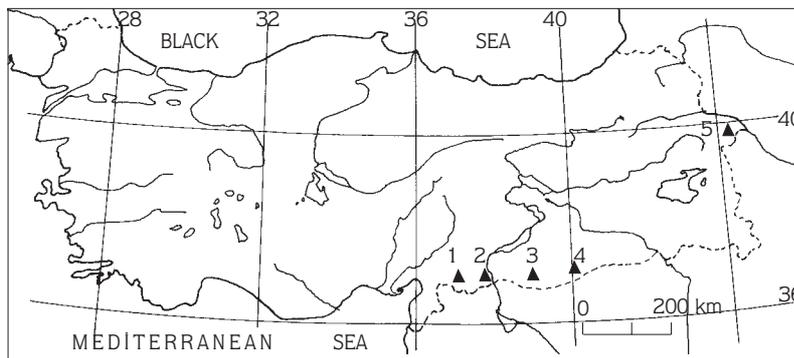


Figure 1. Recorded localities (▲) of *H. auritus*.
1. Kilis, 2. Nizip, 3. Harran, 4. Ceylanpinar, 5. Aralık

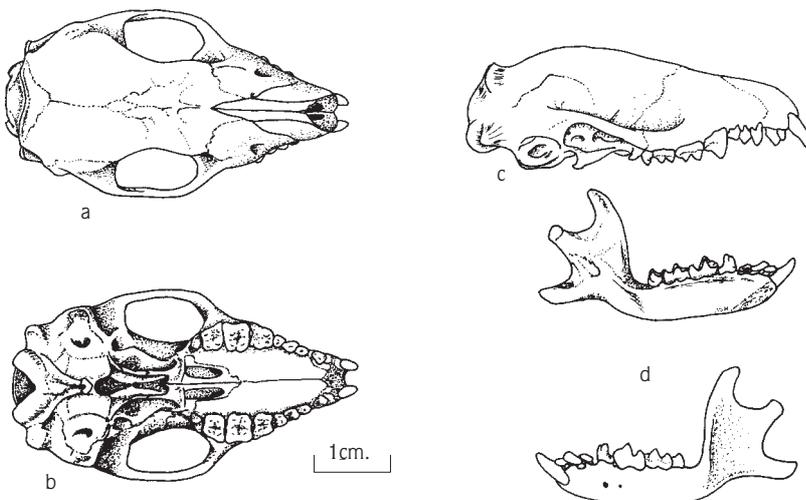


Figure 2. The skull of *H. auritus* from Harran.
a. Dorsal b. Ventral c. Lateral d. Mandible

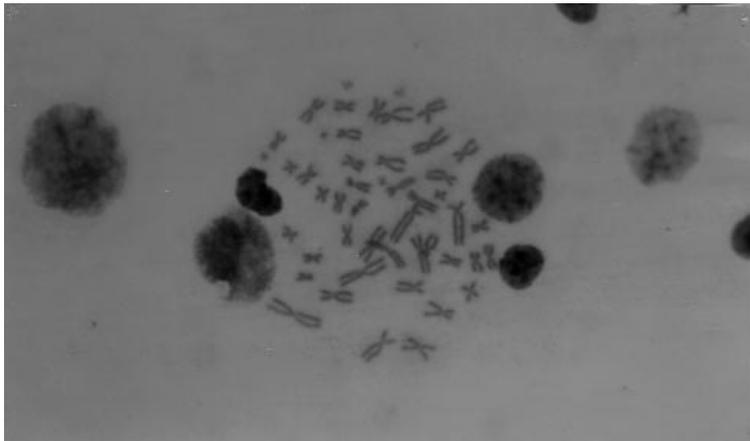
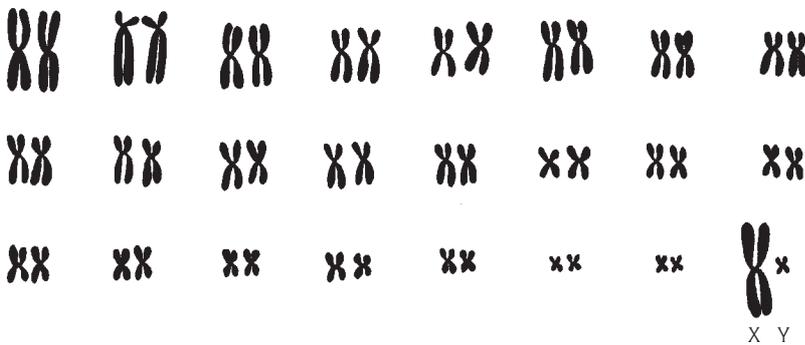


Figure 3. The karyotype of male *H. auritus* from Harran.



External characteristics: The tip of each spine is yellowish white, the subterminal band is darkened and there is a narrow dark band at the base of each spine. Fur on the forehead is yellowish white; the rostrum is darker. The ears are covered with tiny whitish hairs. The underparts are dusty white. Hind and forefeet are dorsally covered with tiny hairs. The soles are naked, with hairy hells.

Cranial characteristics: The skull is small. The rostrum is narrow and tapered anteriorly. The sagittal crest is less developed. The tympanic bullae are large. The palate is narrow, with a posterior notch. the angular process of the half-mandible is elongated; it is more strongly

projected forwards (Fig. 2)

Karyology: $2n = 48$, $NFa = 92$ and $NF = 96$. All the autosomal pairs are bi-armed. The karyotype has a large submetacentric, a large subtelocentric pair, six dot-like chromosomes and 18 submetacentric and metacentric pairs. The X chromosome is a large metacentric and the Y chromosome is the smallest metacentric (Fig. 3).

Glans penis: The glans penis has two rows of 12-14 dorsal spines. It is maked ventrally. The tip of the glans penis is cracked laterally. It measures 47 mm in length and 0.6 mm at the widest part of the tip (Fig. 4).

Biology Observations: On 20 June 1996, a pregnant

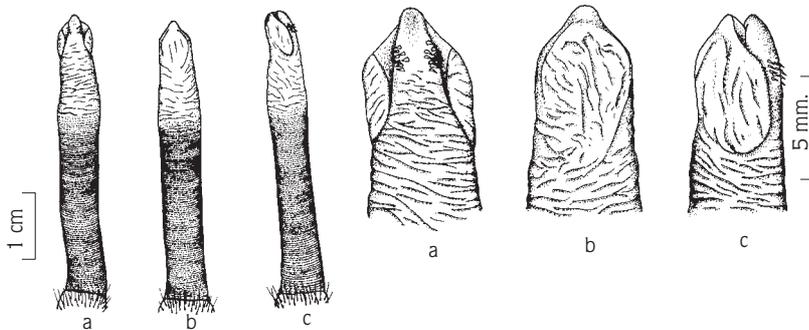


Figure 4. Glans penis of *H. auritus* from Harran
a. Dorsal b. Ventral
c. Lateral

female taken from the wild gave birth to four pups (Fig. 5) in captivity. We measured, weighed and observed these pups during postnatal development. The mean measurements and weight of the four pups at birth were: total length, 44 mm, tail length, 4.25 mm, hind foot, 7.0 mm, ear, 3.25 mm and body weight 6.74 g. There is a naked dorsal line extending from the head to the base of the tail (Fig. 5). Two different types of spine were observed; long white spines, 5-7 mm in length, and white-black ones of 1-2 mm. When disturbed, they attacked by erecting their spines. On 22 June 1996, two pups died. Similar to the adults, the remaining pups started to curl when touched. The pups (n=2) had a total length of 74.2 mm; the tail length was 8 mm, hind foot, 12 mm, ear, 9.5 mm, and body weight, 22.23 g on day seven (Fig. 6). After 22 June 1996, we could not measure the pups because of curling. On 8 July 1996 another pup died. One pup 25 July 1996. It had a body weight of 103.5 g. *H. auritus* opened their eyes and ears day 20. Fur development was completed on day 20. Weaning took place on day 31. At the age of 25 days, the young fed freely. One pup became independent on day 42.

Discussion

H. auritus calligoni Satunin, 1901, a subspecies of *H. auritus*, was described from a specimen found in Aralık (Turkey), based on coloration and body size (2). In the study presented here, only two skulls of *H. auritus* from Aralık and a comparison of the external and cranial measurements of these skulls with the type and with specimens from southeastern Turkey showed that the

specimens from Aralık and southeastern Turkey belong to *H. auritus calligoni*. Harrison (4) and Harrison and Bates (9) referred to specimens from Iraq, Syria, Jordan and Israel as *H. auritus calligoni*. We compared Turkish specimens to those given by Harrison (4) and Harrison and Bates (9) and identified the Turkish specimens as *H. auritus calligoni*. The karyotype of *H. auritus* contains $2n = 48$ chromosomes in Iraq (12), Daghestan (10) and Egypt (13). According to Bhatnagar and El-Azawi (12), the karyotype of *H. auritus* in Iraq consists of 43 macro- and 5 micro-chromosomes. We found the same karyotype in the Turkish specimens, with the exception of the large metacentric X chromosome and the metacentric Y chromosome. The karyotype of *H. auritus* in Turkey is similar to that described by Zima and Kral (16).

In *Erinaceus europaeus*, a karyotype with $2n = 48$ chromosomes has one medium-sized acrocentric pair (16), while there is no acrocentric chromosome in *H. auritus*. In most species of hedgehogs, the diploid chromosome number has been described as 48 (13, 17, 18, 19, 20). These authors noted large subtelocentric chromosomes in the karyotypes of other hedgehogs, as observed in the karyotype of *H. auritus* in Turkey. According to Doğramacı and Gündüz (21), *E. concolor* in Turkey has $2n = 48$, $NFa = 90$ and $NF = 94$, and the autosomes contain four pairs of large subtelocentrics and one pair of small acrocentric, whereas there were no acrocentric chromosomes in the karyotype described in this study of *H. auritus*. The sex chromosomes are variable in most species of hedgehogs. The X chromosome is metacentric (the smallest of the macro-chromosomes) (12) and submetacentric (18) in *E. europaeus* and large metacentric in *H. auritus*, which is



Figure 5. Newborn of *H. auritus*.

different from the results of Bhatnagar and El-Azavi (12) and Hsu and Benirschke (18) but the same as in *E. concolor* (21).

The Y chromosome is a micro-chromosome and subtelocentric in *H. auritus*, a medium-sized submetacentric in *Paraechinus* (12), micro-submetacentric in *E. e eurpaeus* (18) and micro-metacentric in *E. concolor* (21). In *H. auritus* and *P. aethiopicus* in Iraq, but similar to *E. concolor* in Turkey. This shows that the Y chromosome is variable both the

intrapopulation and intrapopulation of the family Erinaceidae.

Corbet (5) stated that, in *H. auritus*, the spines of the glans penis are usually short and conical, in two rows. This is consistent with the Turkish specimens (Fig. 4).

In Israel, Schoenfeld and Yom-Tov (8) found out that litter size ranged from 2 to 3, that the body weight of a *Hemiechinus* pup was 8 g and that two pups reached a mean weight of 65 g on the 14 th day after birth. In this



Figure 6. *H. auritus* at one week of age.

study, the mean body weight of four pups was determined to be 6.74 g, and one pup reached 90 g on day 18 and 104 g on day 35. This showed that the young of *Hemiechinus* gain weight very rapidly during the first month of postnatal life.

References

1. Ellerman, J.R., Morrison-Scott, T.C.S. Checklist of Palaearctic and Indian Mammals, 1758 to 1946. Brit. Mus. Nat. Hist. London. 1951.
2. Bobrinsky, N.A., Kuznetsov, B.A., Kuzyakin, A.P. Key to the Mammals of the USSR, 2nd edition. Izdatel stvo. Prosveshchenie, Moscow (in Russian). 1965.
3. Niethammer, J. Zur Taxonomie der Ohrenigel in Afghanistan (Gattung *Hemiechinus*). Z. Säugetierk. 34:257-274, 1969.
4. Harrison, D.L. The Mammals of Arabia: Lagomorpha and Rodentia vol. 3. Ernest Benn Ltd. 385-670. London. 1972.
5. Corbet, G.B. The mammals of the Palaearctic Region: a taxonomic review. British Museum (Nat. Hist.). Cornell Un. Press. London and Ithaca. 1978.
6. Corbet, G.B. The family Erinaceidae: a synthesis of its taxonomy, phylogeny, ecology and zoogeography. Mammal Rev. 18 (3):117-172. 1988.
7. Osborn, D.J., Helmy, I. The Contemporary Land Mammals of Egypt (including Sinia). Fieldiana (Zool.) No.5:1-579. 1980.
8. Schoenfeld, M., Yom-Tov, V. The biology of two species of hedgehogs, *Erinaceus europaeus concolor* and *Hemiechinus auritus aegyptius*, in Israel. Mammalia 49(3):339-355. 1985.
9. Harrison, D.L., Bates, P.J.J. The Mammals of Arabia. Second edition. Harr. Zoll. Museum. Publication. Kent. 1991.
10. Orlov, V.N. Chromosome complements of the hedgehogs from East Europe. Mat. II. vsesoj. sov. pomlekoopit. N.N. Voroncov (ed.):6-7 (in Russian). 1969.
11. De Hondt, H.A. Karyological studies on two insectivores of Egypt. Proc. Egypt. Acad. Sci. 25:171-174. 1988.

12. Bhatnagar, A.N., El-azawi, T.F. A Karyotype Study of Chromosomes of Two Species of Hedgehogs, *Hemiechinus auritus* and *Paraechinus aethiopicus* (Insectivora:Mammalia). *Cytologia* 43:53-59. 1978.
13. Gropp, M., Citoler, P., Geisler, M. Karyotype variation and heterochromatin pattern in hedgehogs (*Erinaceus* and *Hemiechinus*). *Chromosome* 27:228-307. 1969.
14. Sobti, R.C., Gill, S.S. Chromosome number in fifteen mammals from India. *Mamm. Chrom. Newsl.* 21:107. 1980.
15. Ford, C.E., Hamerton, J.L. Colchicine-Hypotonic Citrate Squash Sequence for Mammalian Chromosomes. *Stain Tech.* 31:247-251. 1956.
16. Zima, J., Kral, B. Karyotypes of European Mammals I. *Acta. Sc.* Nat. Brno. 8(7):15-17. 1984.
17. Geisler, M., Gropp, A. Chromosome Polymorphism in the European hedgehog, *Erinaceus europaeus* (Insectivora). *Nature* 214:396. 1967.
18. Hsu, T.C., Benirschke, K. An Atlas of Mammalian chromosomes. Vol. 1. Springer Verlag, New York. 1967.
19. Natarajan, A.T., Gropp, A. The meiotic behaviour of autosomal heterochromatin segments in hedgehogs. *Chromosoma* 35:143-152. 1971.
20. Gropp, A., Natarajan, A.T. Karyotype and heterochromatin pattern of the Algerian hedgehog. *Cytogenetics* 11:259-269. 1972.