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Is one knob per increment the minimum on the Alpine ibex' horns (*Capra i. ibex* L.)?

Key words: *Capra ibex*, horn, knobs, trauma

Introduction

In the Alpine ibex *Capra i. ibex* L. males show impressing knobs on the front side of their horns (Couturier 1962, Baumann 2009). One to four knobs are developed per increment (annual horn growth), asymmetry being not unusual. Two knobs per increment are considered to be "normal" or "usual" (Meile et al. 2003). Three to four knobs are not unusual (Couturier 1962, Lüps et al. 2003). Development of only one knob per year – during the whole life – is rare, but can be observed in recent populations (Couturier 1962, Meile et al. 2003, unpublished data) and in historic founds as well (Baechler 1926, Lüps et al. 2006). It is often interpreted as a sign of a bad constitution or the result of unfavourable conditions in the year in question. Two matters need discussion:

1) are two knobs "normal"? In this case only one is formed in years of unfavourable conditions, or is one "normal" and two grow only when conditions are very favourable?
2) Is the development of only one knob the minimum, as a sign of environmental conditions being extremely bad? Couturier (1962) reports "several cases" of increments lacking any knob, but he doesn't tell if that was caused obviously by accident or by any other reason. Here we present an example which supports a "one knob as minimum"-rule.

Material and methods

The animal was shot on September 3rd 2002 in the colony "Gross Lohner", near Adelboden, Swiss Alps, at 2400 m a.s.l. (7^0 35' E / 46^0 26' N). The hunter had been selected to shoot a male of 7th to 11th years, following the governmental management plan (Zuber et al. 2001, internal No 1654). This buck's age was 9 ¼ years (10th year of life), which means that it was born in summer 1993. In its linear body measurements it is close to the mean measurements of a sample of more than 60 males hunted in their 10th year in the same area (table 1). Unfortunately no other information (healed up fractions, scars etc.) was registered.

Results

After a "normal" development of the increments on both sides during the1st to 3rd summer, the development of the left horn went on with only 35 mm and one knob in the 4th , 70 mm

and two knobs in the 5th summer (fig. 1a, table 2). – The right horn in contrast shows a very different pattern. Less than totally 20 mm have been added during the two years after the accident (fig. 1b). Despite this minimal growth in length, two knob-like structures have developed between the 3rd and the 6th increment (fig. 1 b). They can be interpreted as deformed annual knobs in the 4th and 5th increment. Total length of the left horn is 695 mm, of the right 645 mm.

Discussion and Conclusion

Lacking any other information about this individual than table 1 and 2 show, the discussion must concentrate on the fact of the unusual increments on the right horn only. The animal had obviously suffered a trauma in the winter months of its third year of life (autumn 1996 to spring 1997) by an avalanche or precipice. The horn was broken at its base on the *frontale* bone of the skull. The fracture of the hornbase later

Table 1 Comparison of male 1654 with measurements (mm) of 63 males of the same age and the same area

measurements	mean (n = 63) (= 100 %)	male 1654 cm / %
head and body length	139.2	136 / 98
height of the shoulder	86.8	84 / 97
hind leg	32.4	31 / 96
girdle	104.7	94 / 90
horn-length	76.9	right horn 64.5 / 84
		left horn 69.5 /
body weight	61.5 kg	51 kg (eviscerated) 83

Table 2 Length (mm) of increments (measured on the outside of each horn) and of total length (measured along the frontline)

Age	left horn	right horn
1st	30	40
2nd	110	108
3rd	90	95
4th	35	10
5th	70	10
6th	58	70
7th	60	66
8th	65	68
9th	52	63
10th	45	38
Total	695	645

fig. 1a

fig. 1b

resulted in a slight deviation from the axis of symmetry of the skull.
A probably decreasing condition hindered the animal to build up an increment of "normal" length with two knobs even on the undamaged (left) side in the summer following the accident (1997). The injury directly influenced growth and development of the damaged (right) horn during the two seasons following the accident. In the third summer after the accident (1999) both horns developed again in a more or less usual way (in the 6th year 58 mm, 70 mm respectively).

This skull and horns document two facts:
1) When comparing the body measurements of this animal with the mean body measurements of males of the same age from the Berner Oberland (Lüps al. 2007) those parts of the body which show a rapid growth (hind leg, head and body length, height of shoulder) correspond to them. The accident had obviously an influence on the animal's development after it's 3rd winter in those parts of the body which grow slower and which document condition as well (girdle, body weight). This animal is a further example for the observation that horns are good indicators for body condition in Alpine ibex (Buchli & Abderhalden 1998, Filli 2001, Giacometti et al. 2002, Meile et al. 2003).
2) Even when an animal's condition is bad and horn development disturbed, a very short increment and a single knot-like structure can be observed.

Abstract

Two knobs per yearly increment are the "normal" (83.7 %) number found in the Alpine ibex males in the Berner Oberland. Only one knob per increment is often interpreted as a sign of the animal's bad condition and/or health-problems. Here, a case with two extremely short increments and two knob-like structures is described. This horn supports the hypotheses that one knob per increment is the minimum to be built.

Zusammenfassung

Bei der Untersuchung von Steinwildgehörnen aus dem Berner Oberland (Schweizer Alpen) zeigte sich, dass zwei Knoten pro Jahreszuwachs die Regel darstellen (83,7 %). Wird nur ein Knoten (ein- oder beidseitig) gebildet, wird dies als Zeichen einer schlechten Kondition im betreffenden Jahr, bedingt durch Nahrungsengpässe oder gesundheitliche Probleme, interpretiert. Beim vorliegenden Fall entwickelten sich auf dem rechten Horn, wohl als Folge eines Schädel- und Hornbruchs, in den zwei Folgejahren extrem kurze Zuwachse. Bei beiden ist aber jeweils ein knotenartiges Gebilde sichtbar, welches die Hypothese stützt, dass mindestens ein Knoten zur Entwicklung eines Jahreszuwachses gehört, unabhängig von seiner Länge.

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References

Baechler, E. (1926): Zwei seltene Gehörne des Alpensteinbockes (*Capra ibex* L.). – Jahrb. St. Galler naturwiss. Ges. **62**: 101–128.

Baumann, P.W. (2009): Der Alpensteinbock. Ein Leben über dem Abgrund. – hep Verlag, Bern.

Buchli, C.; Abderhalden, W. (1998): Zur Konstitution von Steinböcken im Kanton Graubünden. – Z. Jagdwiss. **44**: 237–243.

Couturier, M. (1962): Le Bouquetin des Alpes. – M. Couturier ed., Grenoble.

Filli, F. (2001): Die Wiederansiedlung des Steinbocks in Theorie und Management. – Dissertation TUM München.

Giacometti, M.; Willing, R.; Defila, C. (2002): Ambient temperature in spring affects horn growth in male Alpine Ibexes. – J. Mammal. **83**: 245–251.

Lüps, P.; Böchlinger, B.; Schmid P.; Zuber, M. (2007): Ontogenese und Variabilität verschiedener Körpermerkmale des Steinwildes *Capra i. ibex* im Berner Oberland (Schweizer Alpen). – Beitr. Jagd- u. Wildforsch. **32**: 495–510.

Lüps, P.; Dauwalder, B.; Fuchs, R.; Zuber, M. (2003): Die Zahl der «Schmuckknoten» beim Alpensteinbock *Capra i. ibex*: Hilfe zur Bestimmung oder Anlass zur Verwirrung? – Z. Jagdwiss. **49**: 261–266.

Lüps, P.; Grieder, S.; Schlüchter, C. (2006): Der Steinbock (*Capra ibex*) vom Strahleggpass. Biologische Aussagen und glaziologische Folgerungen anhand eines 900 Jahre im Eis gelagerten Gehörns. – Contr. Natural Hist. **7**: 1–17.

Meile, P.; Giacometti, M.; Ratti, P. (2003): Der Steinbock, Biologie und Jagd. – Salm Verlag, Bern.

Zuber, M.; Blöchlinger, B.; Lüps, P. (2001): Bewirtschaftung des Steinwildes *Capra i. ibex* im Berner Oberland (Schweiz): Erfahrungen aus den ersten 20 Jahren (1980–1999). – Beitr. Jagd- u. Wildforsch **26**: 33–42.

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