

The Occurrence of *Eothenomys smithi* in Cultivated Fields at the Foot of the Sanuki Range, Shikoku, Japan

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ABSTRACT.— Forty-one specimens of *Eothenomys smithi* were captured on paddy fields dikes, a field of red clover in paddy fields and other cultivated fields at the foot of mountains (altitude 70–350 m) in Shikoku. Among these specimens collected, there were pregnant females, parous females, mature males and young voles. It is likely that the appearance of *E. smithi* on cultivated fields arose from the absence of *Microtus* in Shikoku.

Introduction

Up to the present, the Japanese field vole, *Microtus montebelli*, has not been found on Shikoku, the smallest of four islands of Japan. OTA & JAMESON (1961) wrote that the red-backed vole *Eothenomys smithi* was more abundant at higher elevations and lived alike in forest and grassy slopes in Shikoku. According to TANAKA (1962), *E. smithi* is a dominant species also in high lands above the height of about 800 m. Although a number of specimens of *E. smithi* have been collected at about 500 m in Shikoku (THOMAS, 1912; MIYAO et al., 1966), TANAKA (1954; 1973) asserted that this vole inhabited principally highland habitats in Shikoku.

In 1972 KANEKO showed that a predominant species on lowland habitats (0–50 m) of northern Shikoku was *Apodemus speciosus*, which was caught mainly on river banks, paddy fields, vegetable fields and flood grassland along river side, and *E. smithi* did not appear on these lowland habitats. However, a trapping survey of small rodents has not yet been made on cultivated fields at the foot of mountains in Shikoku. The aim of the present paper is to report ^{the} capture of *E. smithi* on paddy fields dikes, a field of red clover in paddy fields and other cultivated fields at the foot of the Sanuki range (70–350 m), Shikoku, Japan.

Study Areas and Methods

Trappings were carried out in Kagawa Pref. and Tokushima Pref. between November, 1976 and April, 1977, in the following six localities (Fig. 1): Sanuki-aioi (altitude 30–100 m) (Plate 1-a), Seki (altitude 190–220 m) (Plate 1-c), Sanuki-saita (altitude 180–260 m) and Minoura (altitude 70–110 m) (Plate 1-d), in Kagawa Pref.; Awa-ōmiya (altitude 70–110 m) and Nagatani (altitude 300–350 m) (Plate 1-b) in Tokushima Pref.

The trapping method is the same as reported in the previous paper (Kaneko,

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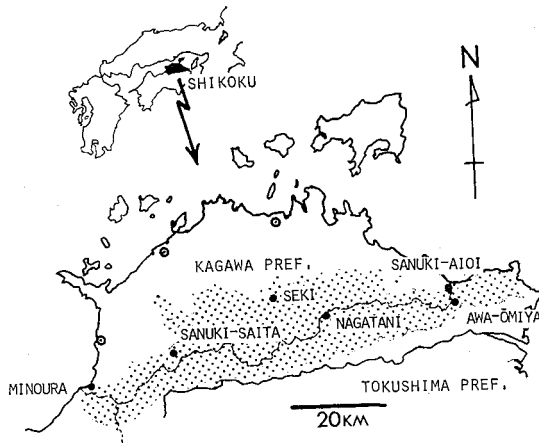


Fig. 1. Map to show six localities in Kagawa Pref. and Tokushima Pref., northern Shikoku, Japan. Stippled areas indicate the altitude over 100 m.

1979). Traps were laid in the mole burrows. Stations of traps were set in lines with an interval of about 10 m. One station was laid with three traps at a distance of one to two meters. At each locality there were 24 to 48 trap stations, most frequently 27. Traps were examined daily, when their catch was removed. Pumpkin seeds were used as bait.

The following 11 principal habitats were recognised; (A) rice stacks (Plate 1-g), (B) red-clover (*Trifolium pratense*) fields in paddy fields (Plate 1-g·h), (C) abandoned fields with scattered shrub, (D) slopes of dikes (Plate 1-c·g), (E) stone fences Plate 1-e), (F) chestnut orchards, (G) mandarin (*Citrus unshu*) orchards, (H) fields of the Japanese pampas grass (*Miscanthus sinensis*) (Plate 1-f), (I) pine forest, (J) coniferous plantations, and (K) bamboo groves. Three habitat types of (G), (I) and (J) were further divided into the following categories: (G1) verge of mandarin orchards, (G2) mandarin orchards other than verges; (I1) scattered shrubs and dense ferns (*Gleichenia* sp.) in pine forest (Plate 1-d) and (I2) shrubby verges of pine forest; (J1) young plantations of the Japanese cypress (*Chamaecyparis obtusa*) or the Japanese cedar (*Cryptomeria japonica*) and (J2) old plantations of the Japanese cedar.

Results and Discussion

The distribution of small mammals according to habitats is given in Table 1. *Apodemus speciosus* was collected on abandoned fields with scattered shrub (C), slopes of dikes (D), chestnut orchards (F), mandarin orchards (G1·2), fields of the Japanese pampas grass (H), pine forest (I1·2), coniferous plantations (J1·2) and bamboo groves (K). *Eothenomys smithi* was captured not only on pine forest with scattered shrubs and dense ferns (I1) (Plate 1-d) but also on a red clover field in paddy fields (B) (Plate 1-g·h), abandoned fields with scattered shrub (C), slopes of dikes (D) (Plate 1-c), the lower border of stone fences (E) (Plate 1-e), the verge of mandarin orchards (G1) and fields of the Japanese pampas grass (H) (Plate 1-f).

Table 1. Summary of the number of small mammals caught and traps on different types of habitats in Kagawa and Tokushima Pref.

Locality Date	Species*	Habitats**													Total	
		A	B	C	D	E	F	G1	G2	H	I1	I2	J1	J2		K
1. Sanuki-aioi May 5, 1977	E			1	1	2				3	0	0				7
	As			0	0	0				0	2	0				2
	Aa			0	0	0				0	2	0				2
	TT			12	12	6				18	30	3				81
May 6, 1977	E	0	1		0		0		0		0	0				1
	As	0	0		2		0		1		0	0				3
	TT	2	6		48		6		1		15	3				81
2. Seki Apr. 15, 1977	E			0	4		0			0		0	0	0	0	4
	As			0	0		0			0		0	0	2	1	3
	Aa			0	0		0			0		0	1	0	0	1
	U			0	0		0			0		0	1	0	0	1
	Cr			0	0		0			0		0	0	1	0	1
	TT			6	23		6			2		3	16	9	15	80
3. Sanukisaita Mar. 30, 1977	E			0	2	0	0	0	0		0		0			2
	As			2	1	0	1	1	3		2		1			11
	Aa			0	0	0	0	0	0		3		1			4
	U			0	0	0	0	0	0		1		0			1
	TT			9	4	2	3	6	10		23		15			72
4. Minoura Mar. 19, 1977	E			1		0		1	0	1	14	0				17
	As			1		0		2	0	0	1	0				4
	Aa			0		0		0	0	0	2	0				2
	U			1		0		0	0	0	0	0				1
	TT			8		8		3	4	2	54	2				81
	Mar. 20, 1977	E										4				
As											1					1
Aa											1					1
TT											81					81
5. Awa-ômiya Nov. 13, 1976		E							1		0	0	0			
	As							1		0	3	1				5
	Aa							0		0	5	1				6
	U							1		0	1	0				2
	Cr							0		0	1	0				1
TT							30		6	72	36				144	
6. Nagatani Feb. 19, 1977	E				0					2	3			0		5
	As				1					3	0			1		5
	Aa				0					0	3			0		3
	TT				3					12	39			18		72

* E: *Eothenomys smithi*, As: *Apodemus speciosus*, Aa: *Apodemus argenteus*, U: *Urotrichus talpoides*, Cr: *Crocidura dsinezumi*, TT: the number of traps.

** For explanation of symbols see text.

Both species were caught in neighboring traps at the same station on fields of the Japanese pampas grass, abandoned fields with scattered shrub, and scattered shrub and dense ferns in pine forest.

Among 41 specimens of *E. smithi* collected, there were three pregnant females, four parous females with open pubic symphysis, seven mature males with tubular

epididymis, and seven young voles under 20 g in body weight. Therefore, it appears that breeding was carried out on these habitats in this vole.

Referring to the collection reports of *E. smithi*, there has been no report, except YOSHIDA (1970), on the occurrence of this vole on cultivated fields. YOSHIDA (1970) showed that one specimen of *E. smithi* was trapped at the corner of vegetable fields (altitude 40–100 m) at the foot of Mt. Kiyomizu, northern Kyushu, but he did not discuss the matter. In his report *Microtus montebelli* was not collected.

Since there are several opinions concerning the genus name of this vole among Japanese mammalogists (IMAIZUMI (1949; 1957; 1960) insisted on *Eothenomys*, TOKUDA (1955) adopted the name *Antelionomys* and TANAKA (1971) supported *Phaulomys*), it is difficult to compare this vole with other species related to it. But it has been considered by the mammalogists mentioned above that the present vole has some affinities to *Clethrionomys* rather than to *Microtus*. Referring to collection reports of *Clethrionomys*, KNOX JONES & JOHNSON (1965) and MIZUSHIMA & YAMADA (1974) showed that *C. rufocanus* was obtained along paddy fields and abandoned paddy fields in the Korean Peninsula and Hokkaido Isl., respectively. In Hokkaido, Japan, *Microtus* does not occur. SAINT GIRON & BEAUCOURNU (1970) reported that *C. glareolus* occurred on open grass land as well as pine forest and marsh on Belle-Isle, France. They further noted that the appearance of *C. glareolus* in these habitats was undoubtedly caused by the absence of *Microtus* on this island. Therefore, it is likely that the occurrence of *E. smithi* on cultivated fields arose from the absence of *M. montebelli* in Shikoku. Further collection studies are needed on cultivated fields at the foot of mountains where *Microtus* is not found.

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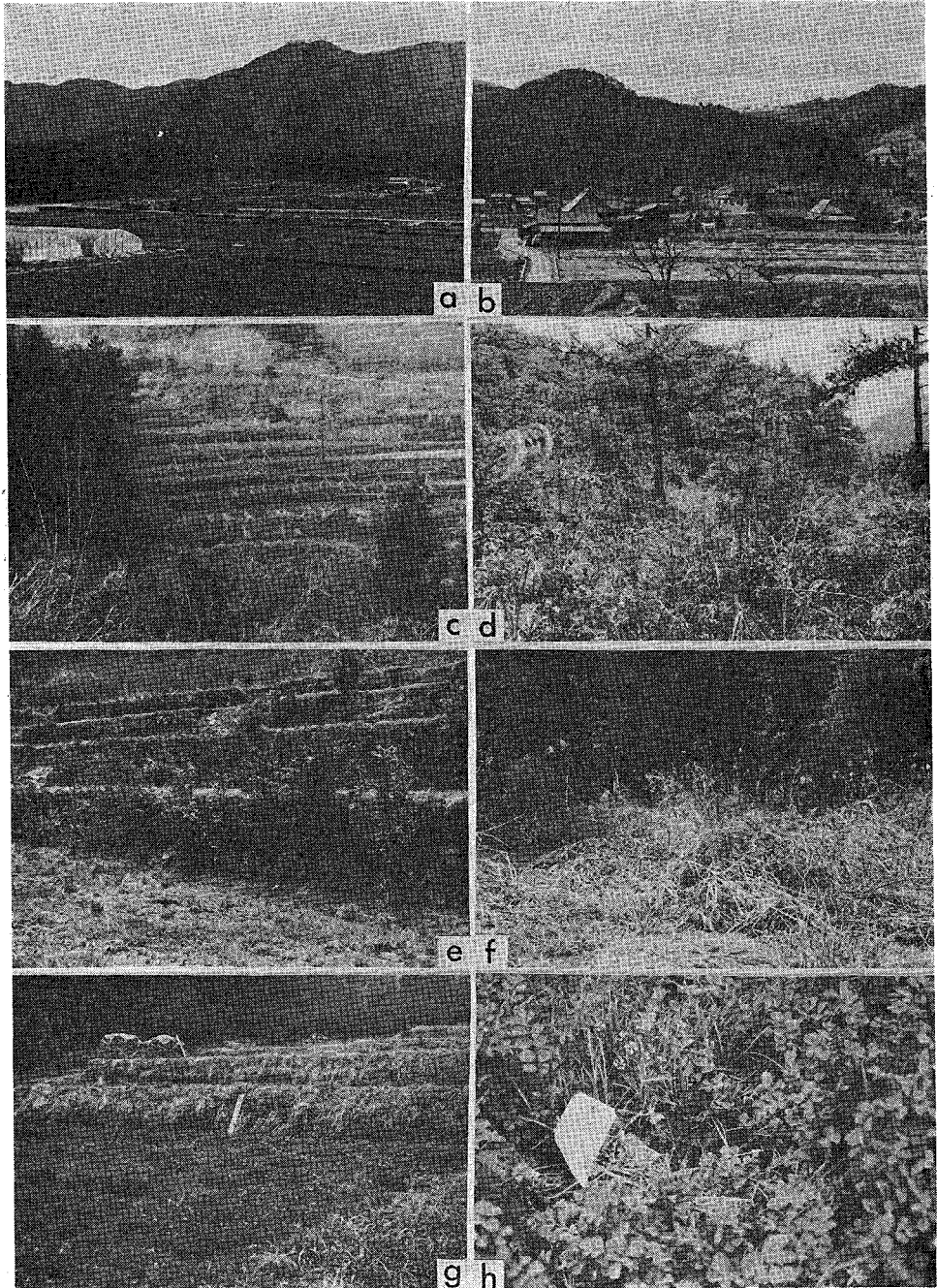
摘 要

金子之史： 四国・讃岐山脈山麓の農耕地とその周辺部における
スミスネズミの分布

1976年11月～77年4月にかけて、スミスネズミ *Eothenomys smithi* 計41頭を、四国の讃岐山脈山麓部（標高70～350m）にある階段状になった水田の堤の斜面、水田中のレンゲ畑、カン木の生えた放棄水田、石垣の下部、ミカン畑の縁、ススキ原、およびカン木とシダの生えたマツ林において採集した。これらの標本のなかには、妊娠雌3頭、経産雌4頭、性的成熟雄4頭、および幼獣7頭が含まれていた。上記の耕作地へのスミスネズミの出現は、四国にハタネズミが棲息しないことによつて生じたのかもしれない。

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Plate 1. Study areas and habitats, where *Eothenomys smithi* was collected.

- a: Sanuki-aioi, showing alluvial fan, which is exhibited in the center of the photograph, and fault scarp, which has been formed by differential erosion. In the alluvial fan there is the study area of paddy fields in terraces.
- b: Nagatani, showing pine forest and shrubby hillside areas.
- c: Seki, showing paddy fields in terraces.
- d: Minoura, showing pine forest areas with scattered shrub and dense ferns (*Gleichenia* sp.).
- e: Stone fence areas between abandoned paddy fields in terraces in Sanuki-aioi.
- f: Fields of the Japanese pampas grass (*Miscanthus sinensis*) in Sanuki-aioi.
- g: Red-clover (*Trifolium pratense*) fields in terraced paddy fields, with rice stacks, which are shown at the left-hand side of the photograph, with mandarin orchards in the background.
- h: A red-clover field in abandoned paddy field. Close-up of the caudal portion of *E. smithi* in the trapped position in the mole burrow.