

A new species of *Arabis* (Brassicaceae) from inner Anatolia

BİROL MUTLU*

Hacettepe University, Faculty of Science, Department of Biology, 06532, Beytepe, Ankara, Turkey

Received April 2003; accepted for publication October 2003

A new species of *Arabis* L., *A. erikii* Mutlu **sp. nov.**, is described and illustrated. The species is restricted to inner Anatolia, south-west of Sivas. It grows on steppes. Diagnostic morphological characters are given for discrimination from the most similar taxa. © 2004 The Linnean Society of London, *Botanical Journal of the Linnean Society*, 2004, 145, 251–256.

ADDITIONAL KEYWORDS: Central Anatolia – conservation – distribution.

INTRODUCTION

Arabis L. had 18 species in Turkey (Cullen, 1965; Davis, Mill & Tan, 1988), but since the most recent revision of the genus (Mutlu, 2002), three new species have been described: *A. lycia* Parolly & P. Hein (Parolly & Hein, 2000), *A. alanyensis* H. Duman (Duman, 2001) and *A. davisii* H. Duman & A. Duran (Duman & Duran, 2001). In addition, two species (*A. alpina* L. and *A. mollis* Steven) have been added as new records (Yıldırım & Dönmez, 1998; Mutlu & Dönmez, 2003). In this paper, *A. erikii* is described as a new species. Consequently, the total number of *Arabis* species in Turkey is now 24.

In 1997, as part of a revision of the genus *Arabis*, the author carried out extensive field studies in Central Anatolia and collected a large number of specimens. During these studies, an unusual population was encountered. At first glance in the field, the specimens looked like *Arabis nova* Vill. and *Arabis montbretiana* Boiss. because of their annual habit and sagittate stem leaf. After closer examination and consultation with the *Flora of Turkey and the East Aegean Islands* (Cullen, 1965; Davis *et al.*, 1988), it was realized that the specimens were quite different from these two species. They were cross-checked with various accounts of *Arabis* in relevant floras, i.e. *Flora Orientalis* (Boissier, 1867), *Flora Iranica* (Hedge *et al.*,

1968), *Flora Europaea* (Jones, 1964), *Flora of USSR* (Komarov, 1939), *Flora of Iraq* (Hedge & Lemond, 1980) and *Flora of Syria, Palestine and Sinai* (Post, 1932). *Arabis nova* and *A. montbretiana* material collected either from the field or kept at Turkish herbaria in Ankara (ANK, GAZI and HUB), Sivas (CUFH), Istanbul (ISTE, ISTO) and Izmir (EGE), was also examined. Authorities for all cited plant names are given according to *Authors of Plant Names* (Brummitt & Powell, 1992). Morphological examination and light microscope pollen studies were carried out. Pollen slides were prepared following Erdtman (1960).

DESCRIPTION

Arabis erikii Mutlu **sp. nov.** (Figs 1–3, 5, 7).

Type: B6 Sivas: Kümbet Village, 4 km from Kümbet, 1650 m, 10.vi.1999, Mutlu 4900. (holotype: HUB; isotype: GAZI).

Diagnosis: Affinis *A. novae* Vill. et *A. montbretianae* Boiss.; sed ab *A. nova* foliis majoribus internodiis foliis 2-3-plo brevioribus (non longis, foliis aequilongis vel 4-plo brevioribus), racemis fructiferis longioribus, racione iflorescentiae longitudinis fructuum numero (1.11–) 2 (–3.33) [non (4.31–) 6.66 (–9.55)], seminibus exalatis (non anguste marginatis) differt. Ab *A. montbretianae* foliis caulibus stellatis, furcatis et dense simpliciter hirtis (non modo stellatis et furcatis), racemis fructiferis longioribus, racione inflores-

*E-mail: mutlu@hacettepe.edu.tr

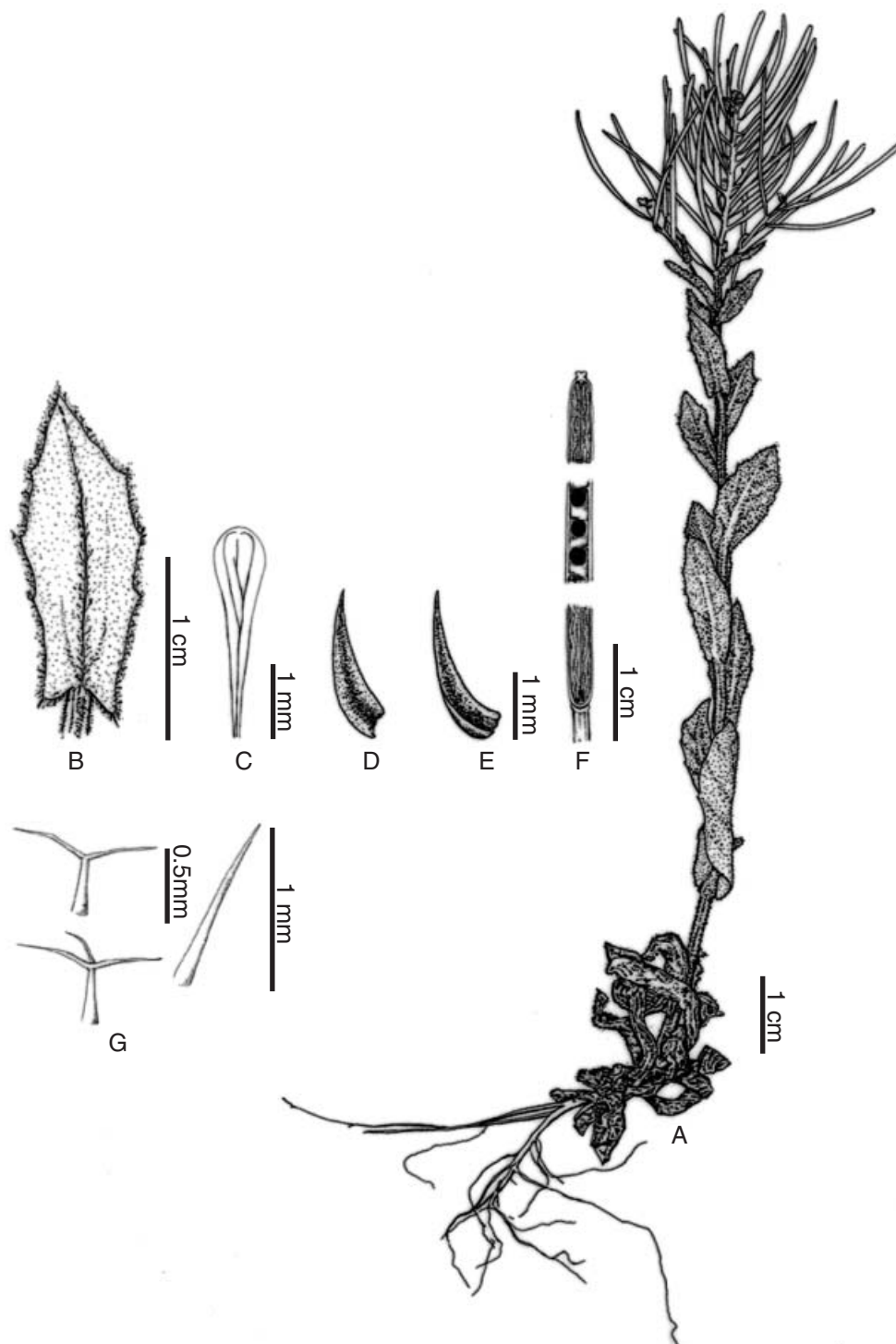


Figure 1. *Arabis erikii* sp. nov., A, habit; B, leaf; C, petal; D, inner sepal; E, outer sepal; F, fruit; G, hairs.

centiae longitudinis fructuum numero (1.11–) 2 (–3.33) [non (5–) 10.4 (–16.4)] recedit.

Description: Annual herb. Stem erect, 8.7–20.3 cm, long and short 2–3 furcate hairy, unbranched with 9–

15 leaves, reddish. Rosette leaves elliptic obovate to oblanceolate, 5–10 × 2–4 mm; hairs sparse, 2–4 furcate and simple. Cauline leaves oblong–lanceolate (9–) 10–14 (–15), 13–22 × 5–9 mm, auriculate, sessile, obtuse or acute, stellately branched and simple hairs on

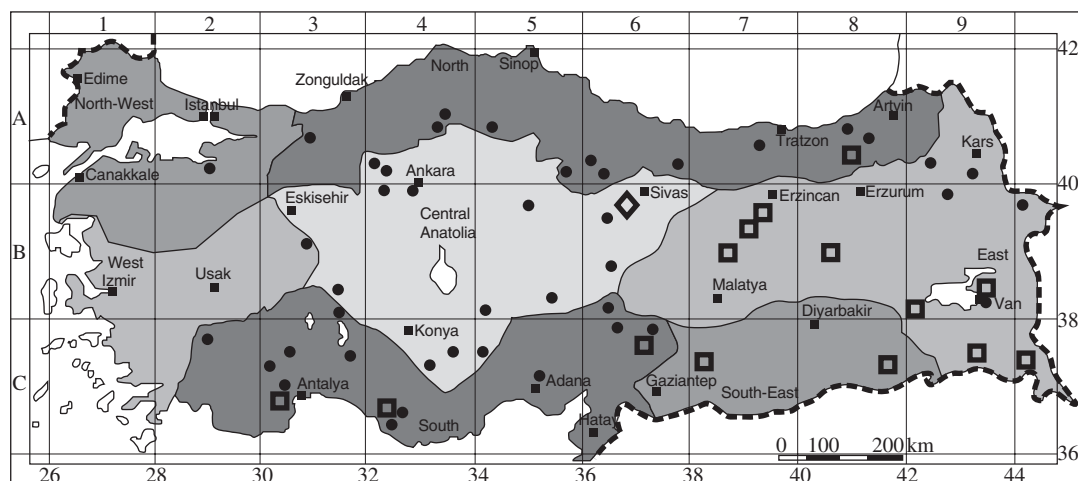


Figure 2. Distribution of *Arabis erikii* sp. nov. (◇); *A. montbretiana* (□); *A. nova* (●).

upper surface. Inflorescence subcorymbose, 8–28 flowered, (10–) 17–47 (–50) mm, glabrous. Sepals 1.5–2.25 mm, greenish white, margins membranous, glabrous. Petals white, 2.5–4 mm, oblanceolate to spatulate, obtuse. Long filaments c. 2.5 mm, short filaments c. 1.5 mm, anthers c. 0.5 mm, yellow. Fruiting pedicels erect to spreading 1.5–2 mm. Siliquae 20–35 × 0.6–1 mm, flattened, the valves with a conspicuous median nerve, glabrous; style very short to 0.2–0.4 mm, stigma capitate. Ratio of inflorescence length/fruit number (1.11–) 2 (–3.33). Seeds c. 0.7–1.1 × 0.4–0.6 mm, unwinged, slightly mucilaginous on wetting, (3–) 16–28 (–29) in each locule, uniseriate; radicle accumbent.

Phenology: Fl. 4–6 and Fr. 5–6.

Ecology, distribution and status: This new species grows with *Astragalus microcephalus* Willd., *Trifolium campestre* Schreb., *Acantholimon reflexifolium* Bokhari, *Verbascum wiedemannianum* Fisch. & Mey., various grasses of Central Anatolia steppe, 1650 m. Endemic, Ir.-Tur. element.

This new species was collected from only one locality in the Kümbet district in Sivas province in Central Anatolia (Fig. 2).

Plants flourish in the area and there is no harmful insect predation. Animals graze the area heavily. Therefore, it is suggested that this new species should be placed under IUCN threat category 'Critically Endangered' (CR) (IUCN, 2001), because the estimated area of occupancy is less than 10 km² and it is only known from the type locality.

Etymology: This new species is named in honour of Prof. Dr Sadik Erik, adviser of my PhD thesis.

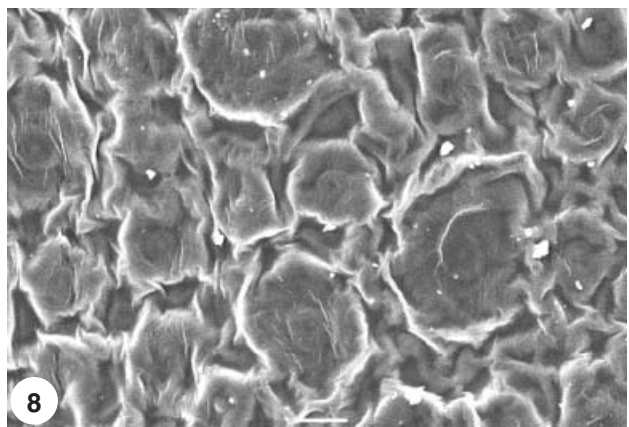
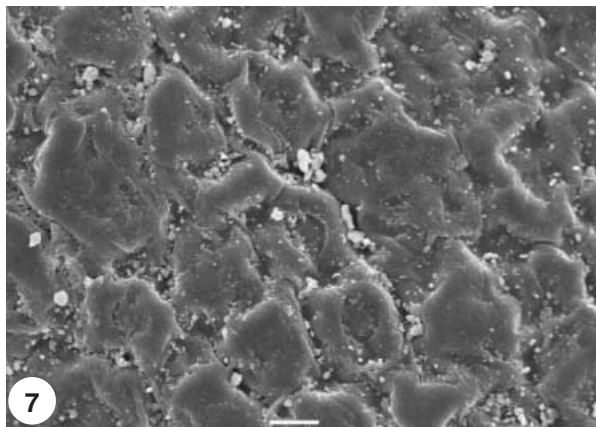
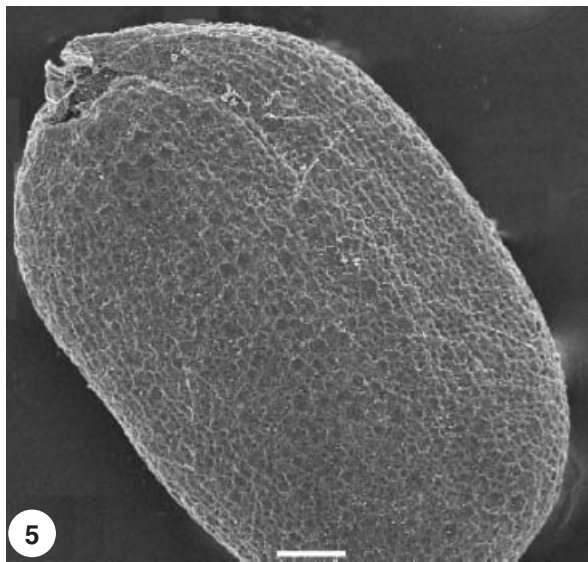
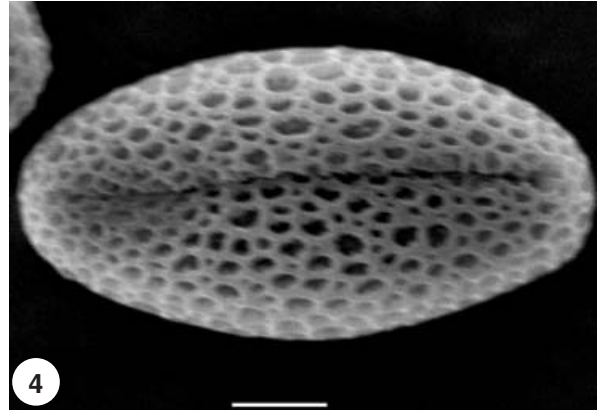
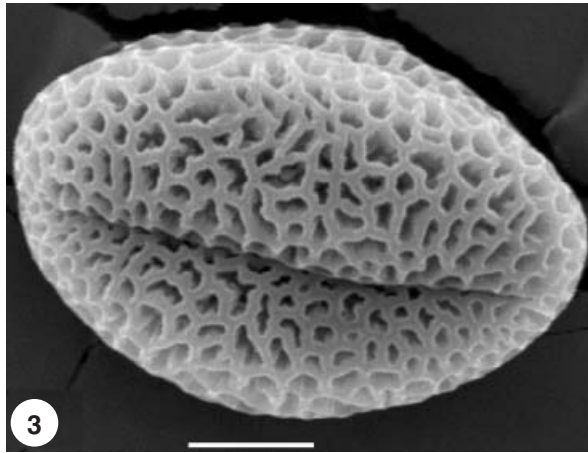
DISCUSSION

Arabis erikii is certainly related to *A. nova* and *A. montbretiana* and these species have been placed in sect. *Alomatium* on the basis of their annual habit and separate nectar gland on the base of filaments.

Arabis erikii has a short and dense inflorescence in fruit [ratio of inflorescence length/fruit number (1.11–) 2 (–3.33)], but in *A. nova* and *A. montbretiana*, inflorescence in fruit is long and lax [(4.31–) 6.66 (–9.55) and (5–) 10.4 (–16.9)]. In addition, the median stem leaves of *A. erikii* are equal to or longer (×0.25) than internodes. *Arabis montbretiana* differs from *A. erikii* and *A. nova* in that it has dorsally compressed fruits and only stellate and forked hairs on the upper surface of the stem leaves.

The pollen size and shape measurements are provided in Table 1. A representative pollen grain and seed are illustrated in Figures 3–8. Pollen shape (prolate-spheroidal) and size are similar in these species (Figs 3–6), but *A. erikii* has undulate muri (Fig. 3) and the structure of the seed surface in *A. nova* is much more rugose (Figs 6, 8).

This new species occurs geographically between *A. nova* and *A. montbretiana*; *A. nova* has the widest distribution of the three species (Fig. 2). While the first is mainly distributed in northern, northern-south, west, southern, eastern and central Anatolia, *A. montbretiana* is localized in southern, eastern and south-eastern Anatolia. *Arabis erikii* is found in the north-eastern parts of inner Anatolia. With respect to morphological relationships between these three species and their distribution pattern, it is a possibility that *A. nova* is the ancestral species of *A. montbretiana* and *A. erikii*. Although they show close relationships, the two



Figures 3–8. Pollen (Figs 3,4), seed and seed surface (Figs 5–8) of *A. erikii* sp. nov. (Figs 3, 5, 7) and *A. nova* (Figs 4, 6, 8). Scale bars = 5 μ m in Figs 3, 4. Scale bars in Figs 5, 6 = 100 μ m. Scale bars in Figs 7, 8 = 10 μ m.

Table 1. A comparison of major features in *A. erikii* sp. nov. and the most similar taxa, *A. nova* and *A. montbretiana*

	<i>A. erikii</i>	<i>A. nova</i>	<i>A. montbretiana</i>
Stem (cm)	8.7–20.3	5.4–44	5.8–43
Stem leaves upper surface	unbranched stellate, forked and simple hairy	±branched stellate, forked and simple hairy	±branched stellate and forked hairy
Main stem leaves number	(9–) 10–14 (–15)	(4–) 5–10 (–13)	(2–) 4–7 (–8)
Main stem leaves length	13–22 × 5–9	5.5–25 × 2.25–14	8.5–29 × 3–12
Inflorescence length (mm)	(10–) 17–47 (–50)	(18–) 23–200 (–240)	(35–) 36–210 (–220)
Inflorescence hairiness	–	±stellate and forked	±stellate and forked
Fruit number	8–28	3–37	4–18
Fruit hairiness	–	±forked and simple	±stellate and forked
Ratio of inflorescence length (mm)/fruit number	(1.11–) 2 (–3.33)	(4.31–) 6.66 (–9.55)	(5–) 10.4 (–16.9)
Pedicle (mm)	1.5–2	(1–) 2–3 (–4.5)	2–7
Style (mm)	0.2–0.4	0.25–0.5	0.4–0.5
Seed length (mm)	0.7–1.1	0.7–1.5	0.6–1.12
Seed wing	–	±	±
Seed number per loculus	(3–) 16–28 (–29)	(13–) 15–20 (–22)	(7–) 8–28 (–29)
Polar axis (µm)	21.26	20.52	20.48
Equatorial axis (µm)	20.20	20.01	18.63

REVISED KEY TO ANNUAL *ARABIS* SPECIES IN TURKEY

1. Petal white; filaments without an appendage
 2. Stem leaf auriculate at base
 3. Upper surface of stem leaf, stellate, forked and densely simple hairy; siliqua ± terete
 4. Ratio of inflorescence length/fruit number (1.11–) 2 (–3.33), seed unwinged; median stem leaves longer 1/2–2/3 than internodes in fruit *A. erikii*
 4. Ratio of inflorescence length/fruit number (4.31–) 6.66 (–9.55), seed ± winged; median stem leaves short, equal or longer 1/4 than internodes in fruit *A. nova*
 3. Upper surface of stem leaf only, stellate and forked hairy; siliqua compressed. *A. montbretiana*
 2. Stem leaf cuneate at base *A. aucheri*
1. Petal violet; short filaments with an appendages *A. verna*

derivative species have rather distinctive characters (see Table 1).

There are five annual *Arabis* species (*A. nova*, *A. montbretiana*, *A. aucheri*, *A. verna* and *A. erikii*) in Turkey. A revised key for these five species is given above.

ACKNOWLEDGEMENTS

I am very grateful to S. Topaloğlu for the illustration. I also thank the directors of herbaria of ANK, CUFH, GAZI, HUB, ISTO, ISTE and EGE for allowing the study, and K, E, G and B for the loan of the material. This study was funded by the Scientific Research Unit of Hacettepe University (Project no. 97.02.601.001).

REFERENCES

- Boissier E. 1867.** *Flora Orientalis* Vol. 1. Basel: 165–178.
- Brummitt RK, Powell CE. eds. 1992.** *Authors of plant names*. Kew, London: Royal Botanic Gardens.
- Cullen J. 1965.** *Arabis*. In: Davis PH, ed. *Flora of Turkey and the East Aegean Islands* Vol. 1. Edinburgh: Edinburgh University Press, 422–429.
- Davis PH, Mill RR, Tan K. eds. 1988.** *Arabis*. In: *Flora of Turkey and the East Aegean Islands* Vol. 10. Edinburgh: Edinburgh University Press, 49.
- Duman H. 2001.** A new species of *Arabis* (Brassicaceae) from South Anatolia. *Botanical Journal of the Linnean Society* **137**: 87–90.
- Duman H, Duran A. 2001.** A new species of *Arabis* (Brassicaceae) from South Anatolia. *Israel Journal of Plant Sciences* **49**: 237–240.

- Erdtman G. 1960.** The acetolysis method: a revised description. *Svensk Botanisk Tidskrift* **54**: 561–564.
- Hedge I. 1968.** *Arabis*. In: Hedge I, Rechinger KH, eds. *Flora Iranica, Cruciferae* Vol. 57. Akademische Druck-u. Verlagsanstalt Graz-Austria, 201–210.
- Hedge I, Lemond LM. 1980.** *Arabis*. In: Guest ER, ed. *Flora of Iraq Cornaceae-Resedaceae* Vol. 4. Royal Botanic Gardens, Kew, 1003–1007.
- IUCN. 2001.** *Red list categories: Version 3.1*. Gland, Switzerland and Cambridge, UK: IUCN Species Survival Commission.
- Jones BMG. 1964.** *Arabis*. In: *Flora Europaea* Vol. 1, Tutin TG, Heywood VH, Burges NA, Valentine DH, Moore DM, eds. Cambridge: Cambridge University Press, 290–294.
- Komarov VL. ed. 1939.** *Flora of USSR* Vol. VIII, Moskva-Leningrad: Izdate' stvo Akademii Nauk SSSR, 130–148.
- Mutlu B. 2002.** Revision of *Arabis* genus in Turkey, Unpublished DPhil Thesis, Hacettepe University.
- Mutlu B, Dönmez AA. 2003.** *Arabis mollis* Steven (Brassicaceae): a new record for Turkey. *Turkish Journal of Botany* **27**: 235–238.
- Parolly G, Hein P. 2000.** *Arabis lycia* (Cruciferae), a new chasmophyte from Taurus Mts, Turkey, and notes on related species. *Willdenowia* **30**: 293–304.
- Post GE. 1932.** *Flora of Syria, Palestine and Sinai*. Beirut: American Press, 65–66.
- Yıldırım Ş, Dönmez AA. 1998.** Two new cultivated families, many species and various square records for the flora of Turkey. *Herb Journal of Systematic Botany* **5**: 59–72.