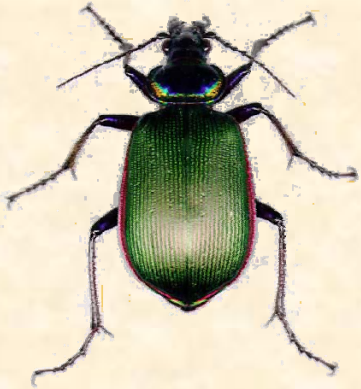


National & Kapodistrian University of Athens



A COMPARISON OF ARTHROPOD COMMUNITIES AT BURNT AND NON-BURNT MOUNTAIN SIDES



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Introduction

- Fires are a major source of habitat change in Mediterranean ecosystems
- Fires are more common at low elevations, but they do occur at medium and high elevations too
- The effects of ‘mountain fires’ on the diversity of animal communities have not received so much attention

In this work we attack the question:

Are the communities of terrestrial invertebrates showing any differences among burnt and non-burnt mountainous sites ?

Methods

Sampling Period

April – November 2001 (7 months)

Sampling Frequency

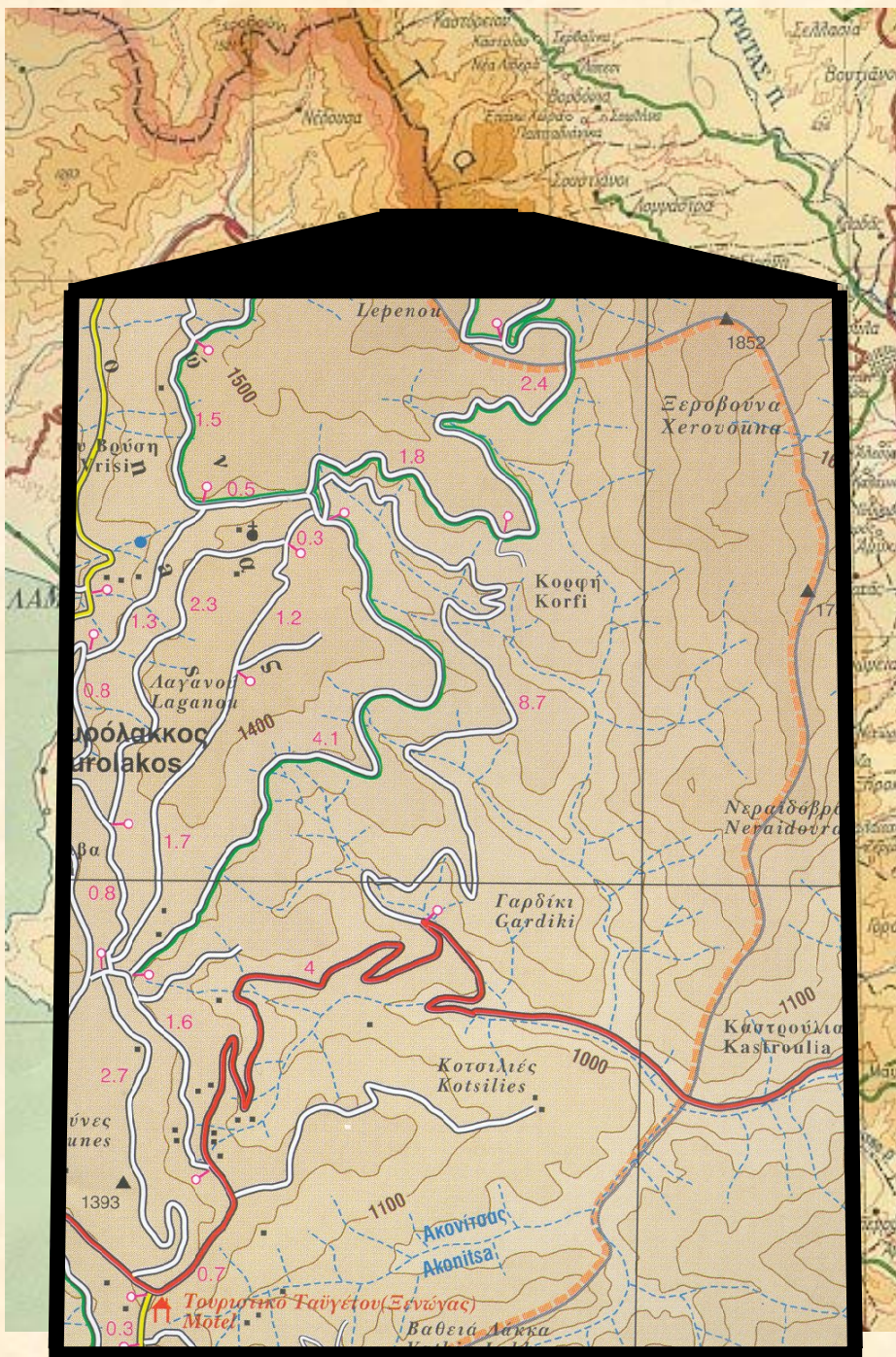
Monthly

Sampling Method

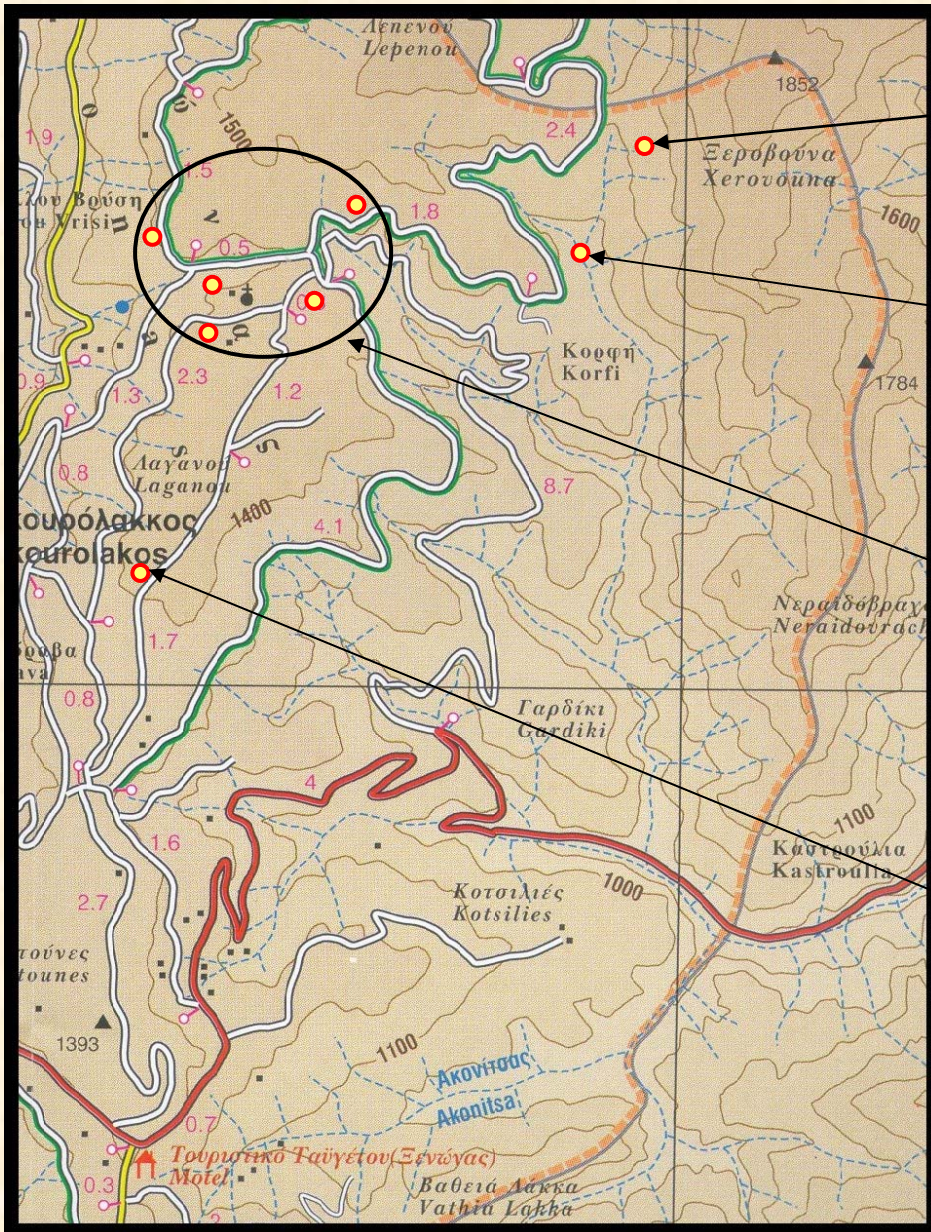
- Standard Pitfall Traps (plastic cups of 250ml containing about 50ml of ethylene glycol)
- 8 traps per biotope laying on a transect lines, and having a distance of 15m between them (in AL biotope → 12 traps due to higher heterogeneity)

Study Area

- South-East Peloponnisisos
- North slopes of Mt. Taygetos
37° 06' North – 22° 15' East
- Altitudinal Range
1400 – 1650 m



Biotopes



• Sub-Alpine
[AL]

• Mixed Coniferous
Forest (*Pinus nigra* & *Abies cephalonica*)
[MF]

• Burnt Forest
[K1 – K5]

• Neighboring Burnt [KA]
And Non-Burnt
(*Pinus nigra* forest) [AK]

Open Biotopes

Sub-Alpine



[AL]

- **Altitudinal Range:** \cong 1650 m.
- **Aspect:** West
- **Coverage:** Rocks, Bushes, Shrubs, Bare Soil.
- **Vegetation:** *Juniperus communis*, *Astragalus* sp., *Poa* sp., *Daphne oleoides*, *Abies cephalonica*, *Ranunculus* sp., Compositae, Gramineae.

Open Biotopes

Burnt



[K1]



[K3]

- **Altitudinal Range:** 1420-1470 m.
- **Aspect:** Varying
- **Coverage:** Shrubs, Burned Logs.
- **Vegetation:** *Trifolium* sp., *Pteridium aquilinum*, *Verbascum* sp., *Poa* sp., *Hypericum* sp., *Fragaria* sp., Compositae, Gramineae.



[K5]

Mixed Coniferous Forest



[MF]

- **Altitudinal Range:** \cong 1500 m.
- **Aspect:** South, South-East
- **Coverage:** Trees, Leaf Litter, Shrubs.
- **Vegetation:** *Pinus nigra*, *Abies cephalonica*, *Pteridium aquilinum*, *Fragaria* sp., Gramineae.

Neighboring Burnt and Non-Burnt Forest



[KA]

- **Altitudinal Range:** \cong 1400 m.
- **Aspect:** South-East
- **Coverage:** Shrubs, Rocks, Bare Soil, Logs.
- **Vegetation:** *Trifolium* sp., *Cerastium* sp., *Sonchus* sp., *Arabidopsis thaliana*, *Pteridium aquilinum*, Compositae.



[AK]

- **Altitudinal Range:** \cong 1400 m.
- **Aspect:** North-West
- **Coverage:** Trees, Leaf Litter, Shrubs.
- **Vegetation:** *Pinus nigra*, *Pteridium aquilinum*.

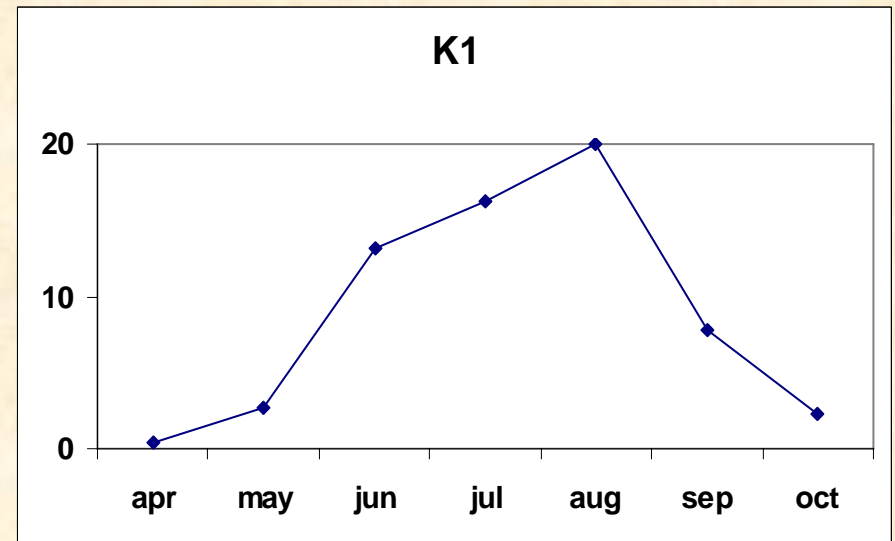
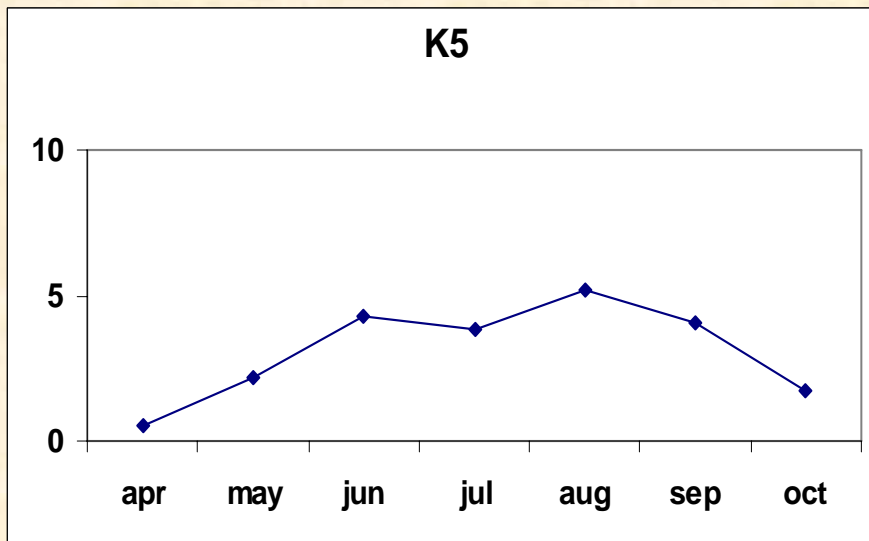
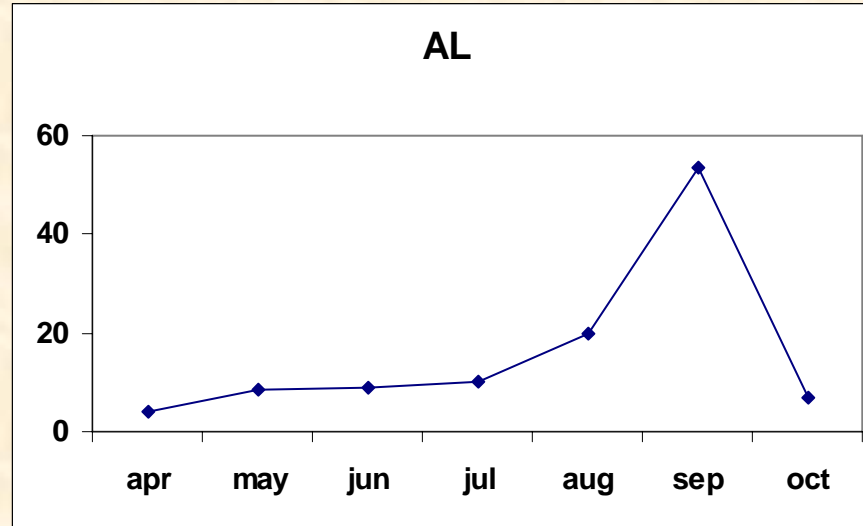
Presence of Carabidae Species per Biotope

| | AL | MF | AK | KA | K1 | K4 | K5 |
|------------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| <i>Calathus corax</i> | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Platyderus graecus</i> | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Molops spartanus</i> | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Carabus merlini</i> | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Microlestes luctuosus</i> | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Syntomus obscuroguttatus</i> | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Calosoma inquisitor</i> | Widely Distributed | Widely Distributed | Coniferous Forest | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Zabrus graecus</i> | Widely Distributed | Widely Distributed | Coniferous Forest | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Tapinopterus duponcheli</i> | Widely Distributed | Coniferous Forest | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Lebia trimaculata</i> | Sub-Alpine | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Masoreus wetterhallii</i> | Sub-Alpine | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Trechus austriacus</i> | Sub-Alpine | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Leistus spinibarbis</i> | Sub-Alpine | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Carabus convexus</i> | Sub-Alpine | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Laemostenus peloponnesiacus</i> | Sub-Alpine | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Tapinopterus rebellis</i> | Sub-Alpine | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Zabrus aetolus hellenicus</i> | Sub-Alpine | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Zabrus robustus</i> | Sub-Alpine | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Carabus coriaceus</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Harpalus honestus</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Calosoma sycophanta</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Notiophilus rufipes</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Leistus magnicollis</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Aptinus lugubris</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Ophonus krueperi</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Leistus rufomarginatus</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Cymindis axillaris</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Notiophilus interstitialis</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Harpalus sulphuripes</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Cymindis sinuata</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Zabrus validus</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Carabus preslii</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Acinopus baudii</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Ophonus cribricollis</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Ophonus taygetanus</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Ophonus cordatus</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Harpalus serripes</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Amara aenea</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Harpalus rubripes</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Harpalus saxicola</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Harpalus rufipalpis</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Amara montivaga</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Amara eurynota</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Bembidion sp</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Calathus cinctus</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Pseudophonus rufipes</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Cymindis lineata</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |
| <i>Leistus parvicollis</i> | Widely Distributed | Widely Distributed | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests | Mainly in Forests |

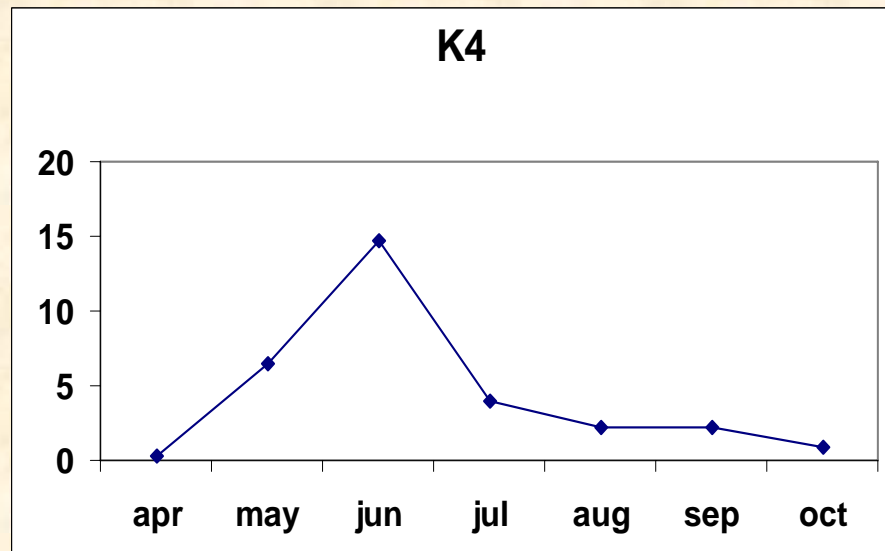
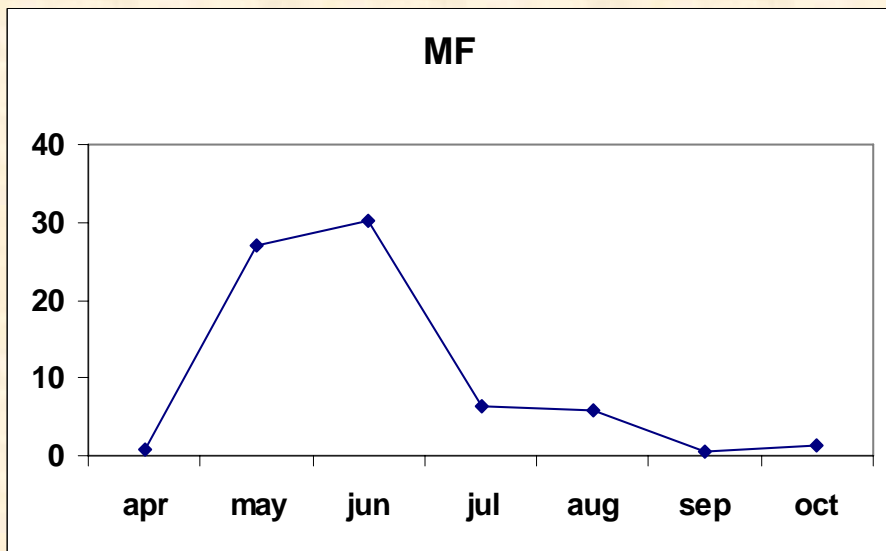
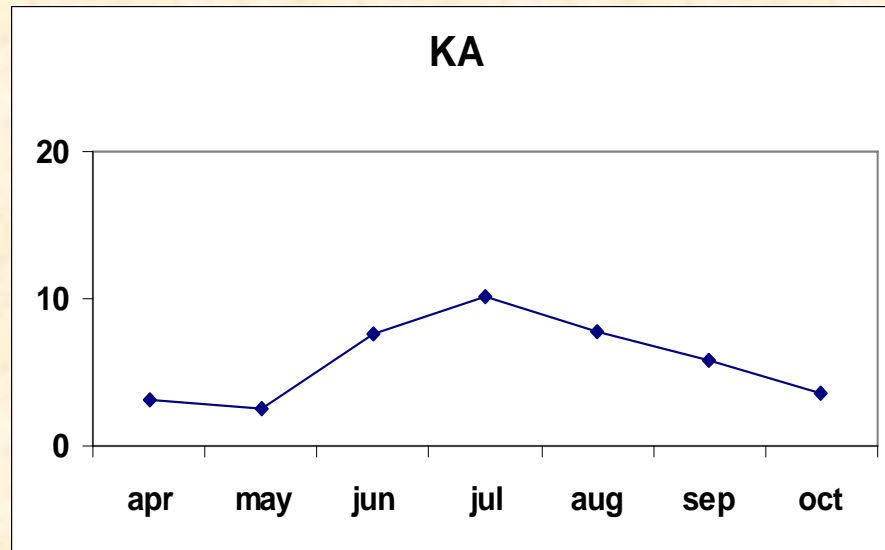
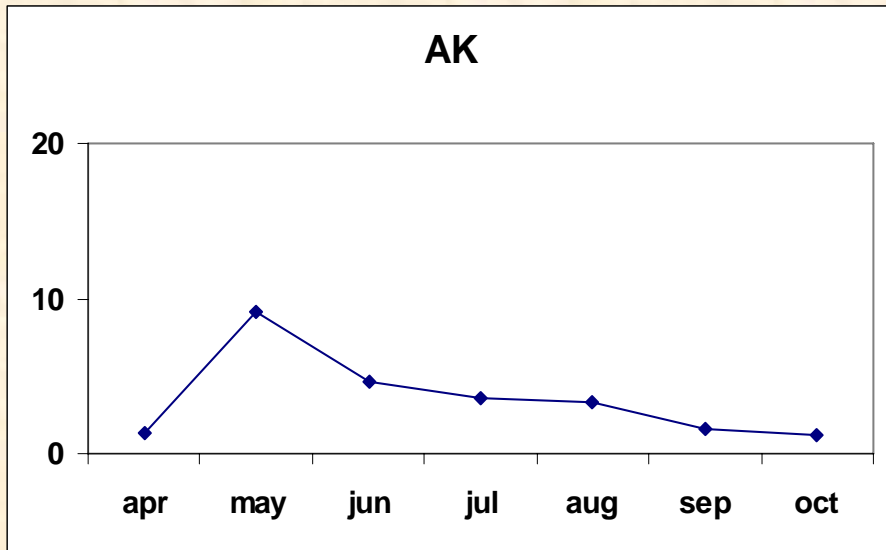
Legend

- Widely Distributed
- Coniferous Forest
- Sub-Alpine
- Mainly in Forests
- Open Biotopes
- Burnt Biotopes
- Various

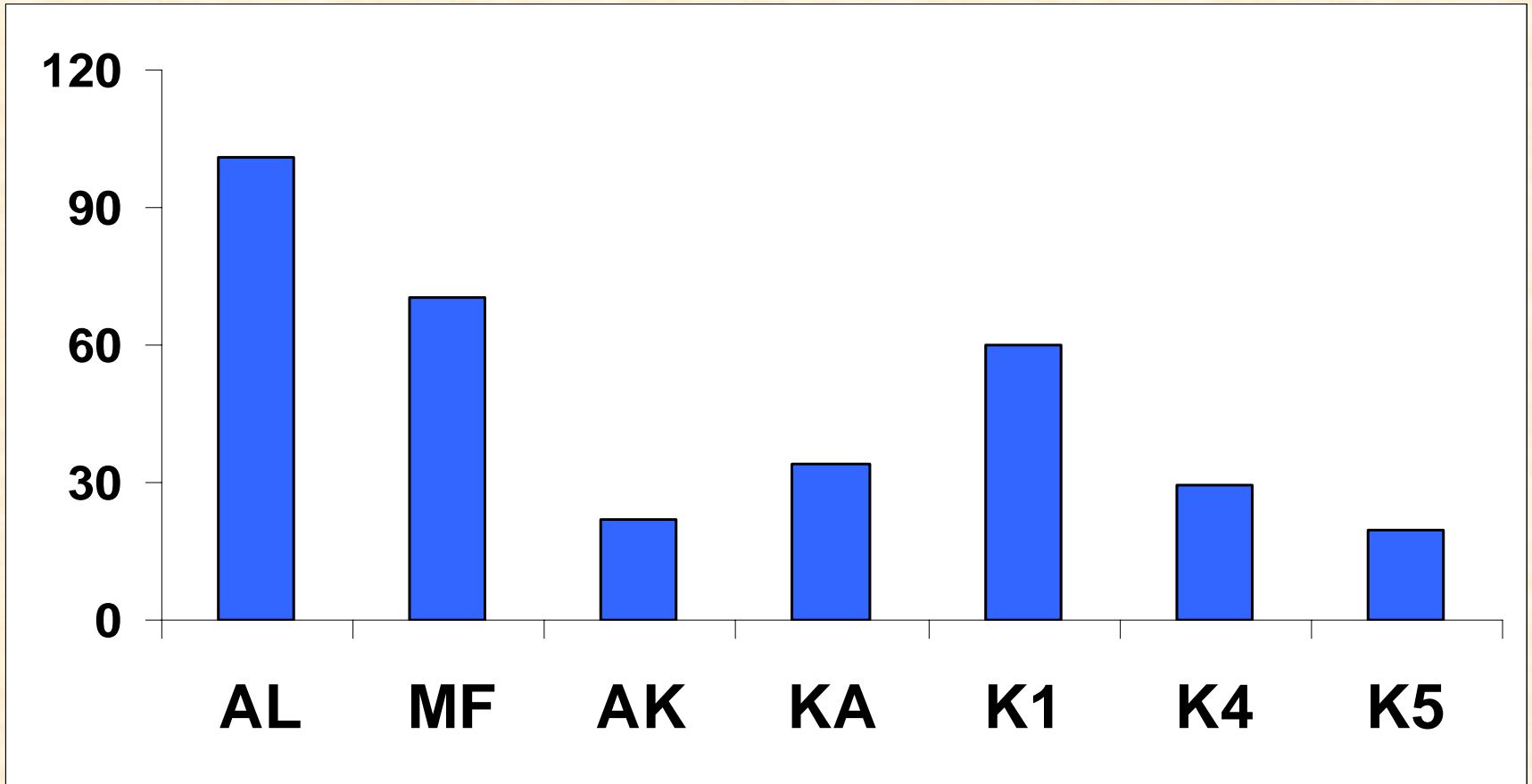
Carabidae abundance per month



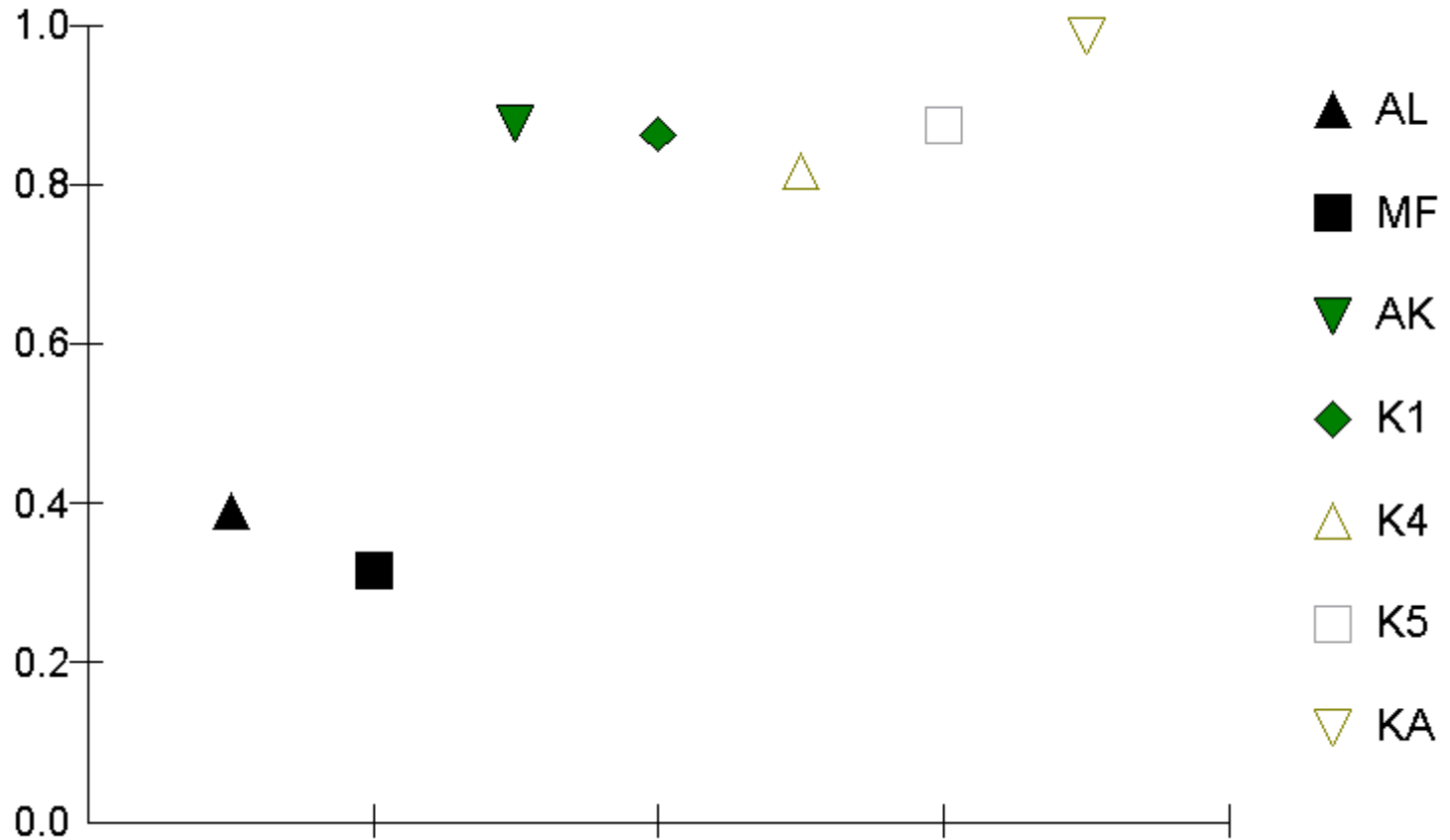
Carabidae abundance per month



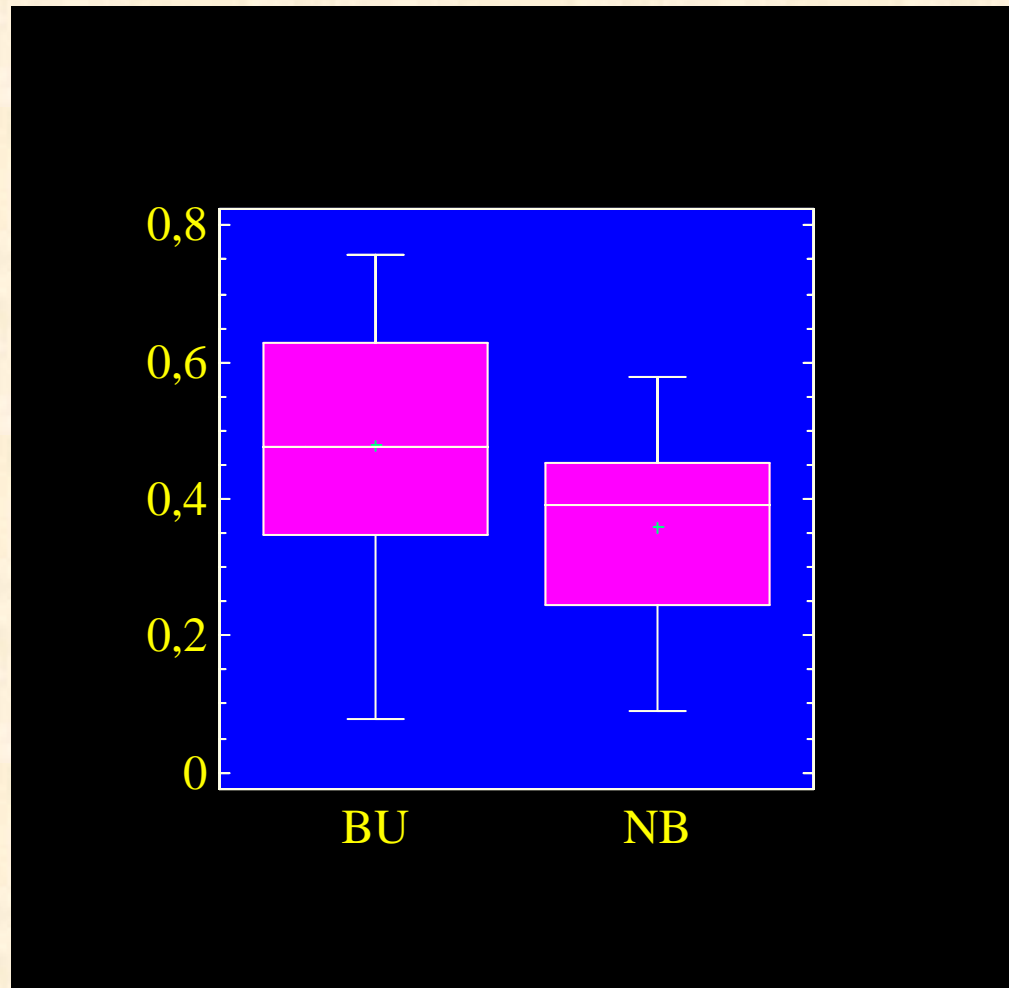
Carabidae abundance (pooled samples)



Carabidae diversity (pooled samples)

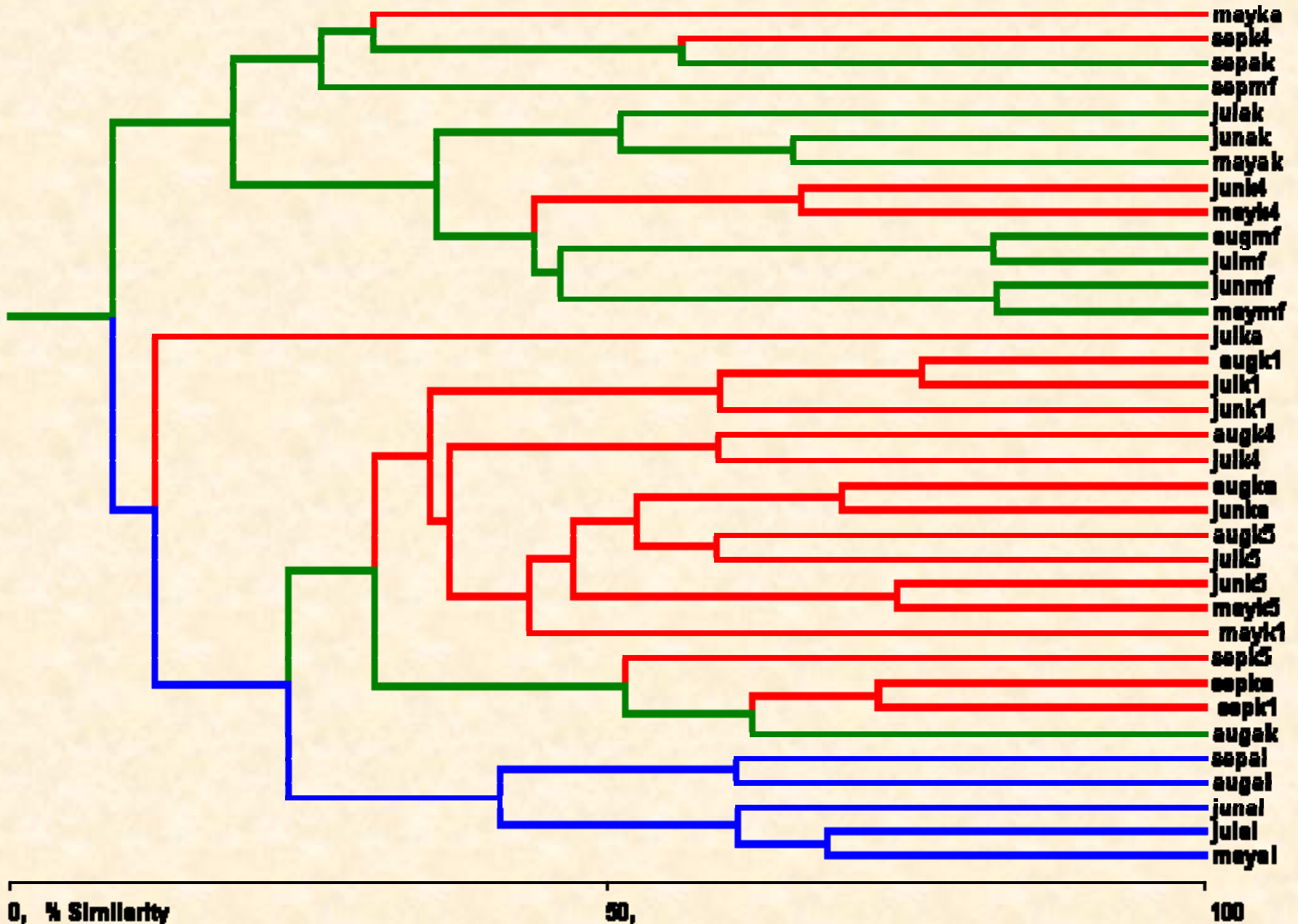


ANOVA of diversities (Shannon index) CARABIDAE (June)

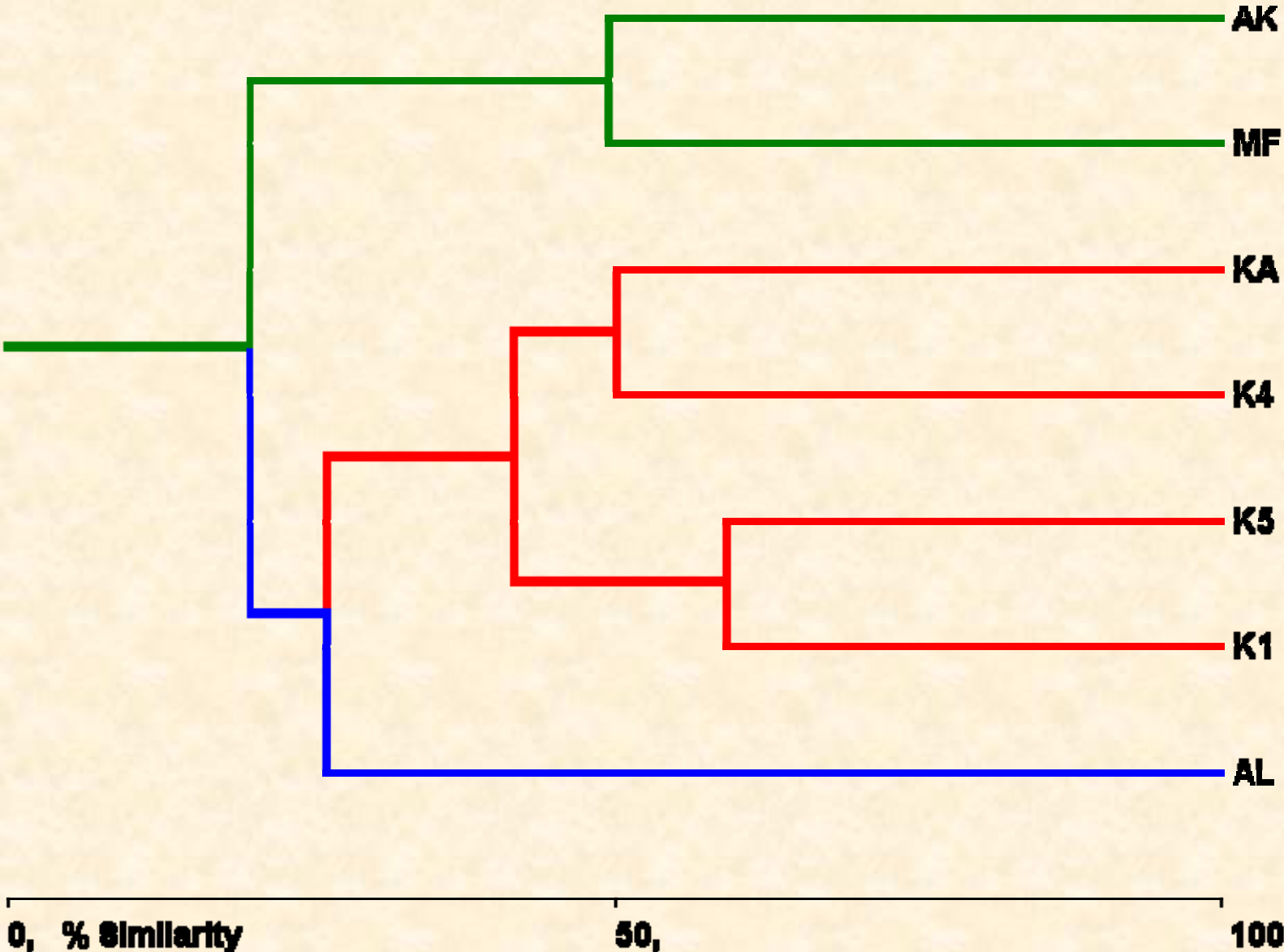


$F = 5.52$ $P = 0.023$

Carabidae (clustering of monthly samples)



Carabidae (pooled samples per station)



Presence of Tenebrionidae Species per Biotope

| | AL | MF | AK | KA | K1 | K4 | K5 |
|-----------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| <i>Laena</i> sp B | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed | Widely Distributed |
| <i>Cylindronotus tuberculiger</i> | Open Biotopes | | | Open Biotopes | | Open Biotopes | |
| <i>Pedinus affinis alziari</i> | Open Biotopes | | | Open Biotopes | Open Biotopes | | Open Biotopes |
| <i>Stenosis orientalis</i> | Open Biotopes | | | | | Open Biotopes | |
| <i>Dendarus plicatulus</i> | Open Biotopes | | | | | | Open Biotopes |
| <i>Asida fairmairei</i> | Sub-Alpine | | | | | | |
| <i>Calyptopsis caraboides</i> | Sub-Alpine | | | | | | |
| <i>Dailognatha quadricollis</i> | Sub-Alpine | | | | | | |
| <i>Dendarus messenius</i> | Sub-Alpine | | | | | | |
| <i>Idastraniella taygetanus</i> | Sub-Alpine | | | | | | |
| <i>Nalassus graecus</i> | Sub-Alpine | | | | | | |
| <i>Pedinus fatuus</i> | Sub-Alpine | | | | | | |
| <i>Pedinus quadratus</i> | Sub-Alpine | | | | | | |
| <i>Pedinus subdepressus</i> | Sub-Alpine | | | | | | |
| <i>Pedinus taygetanus</i> | Sub-Alpine | | | | | | |

Legend



Widely Distributed

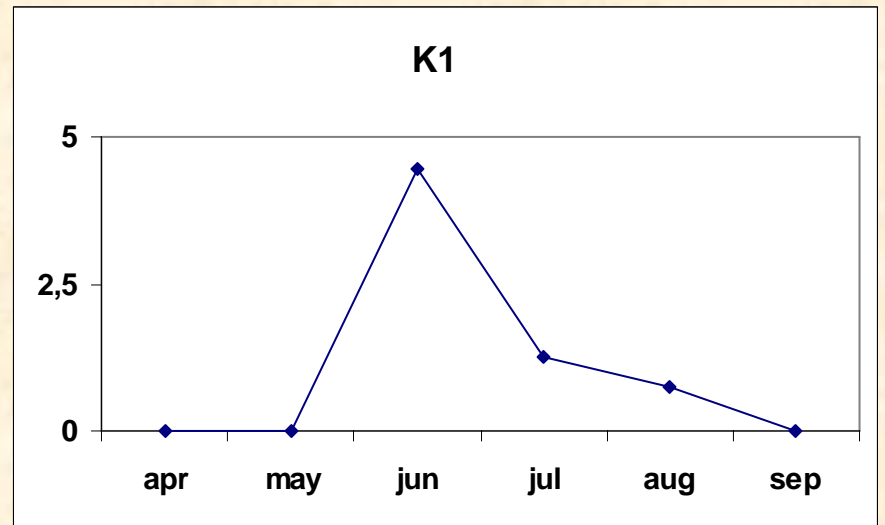
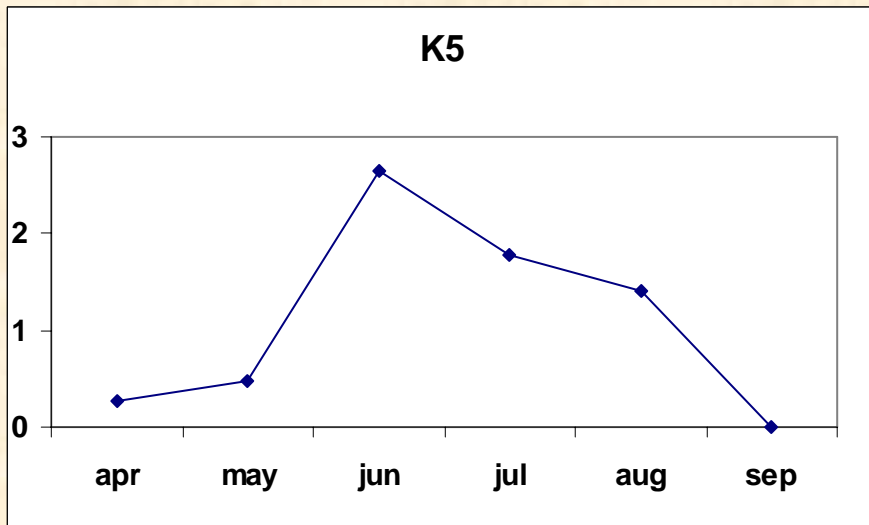
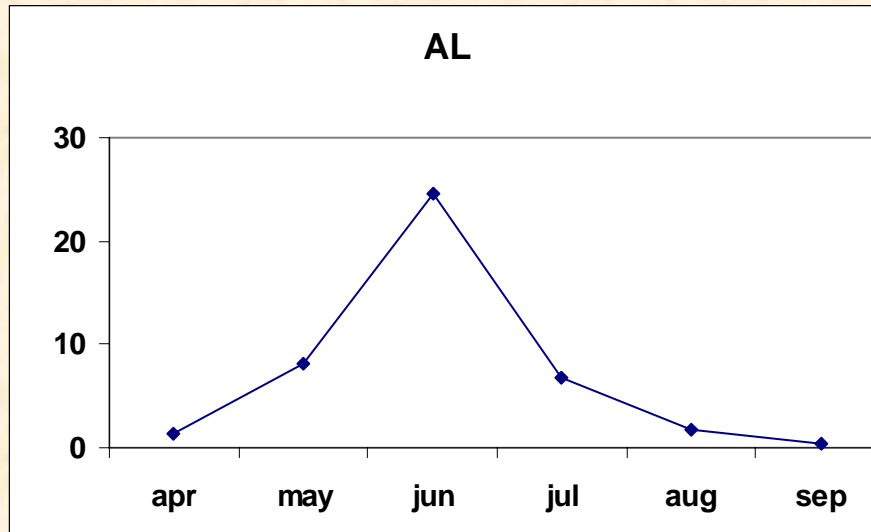


Sub-Alpine



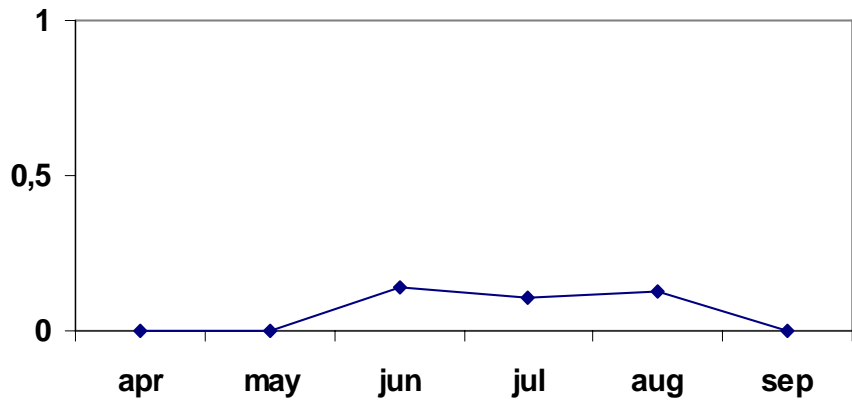
Open Biotopes

Tenebrionidae abundance per month

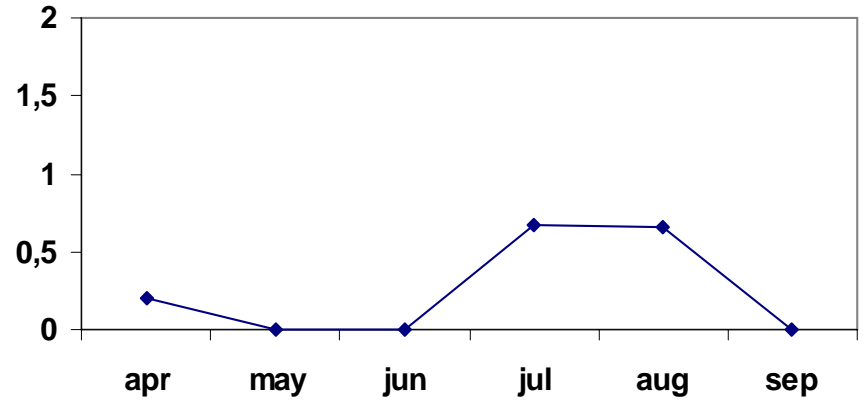


Tenebrionidae abundance per month

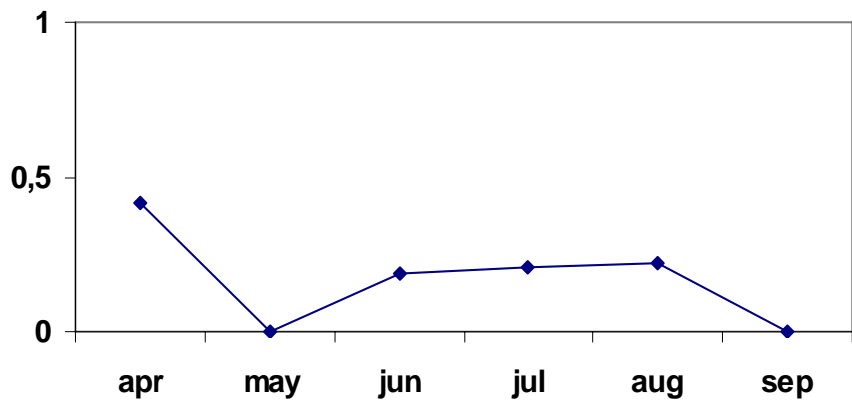
AK



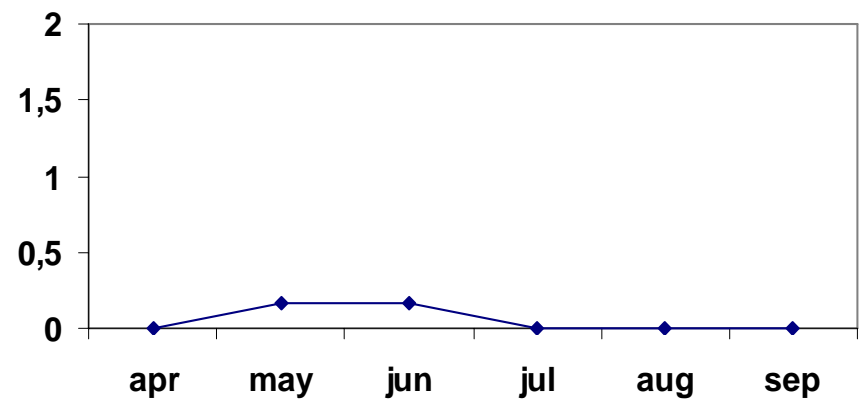
KA



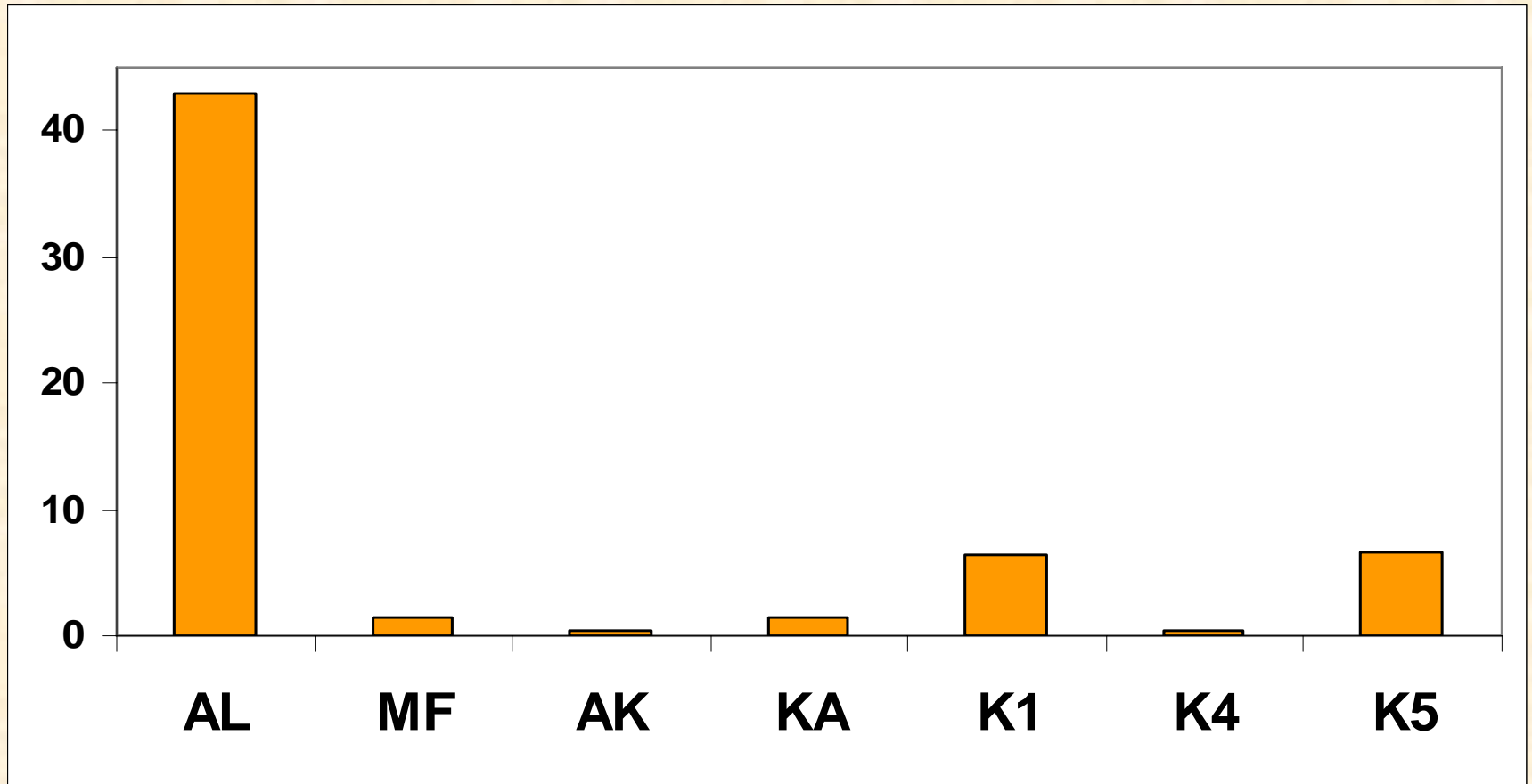
MF



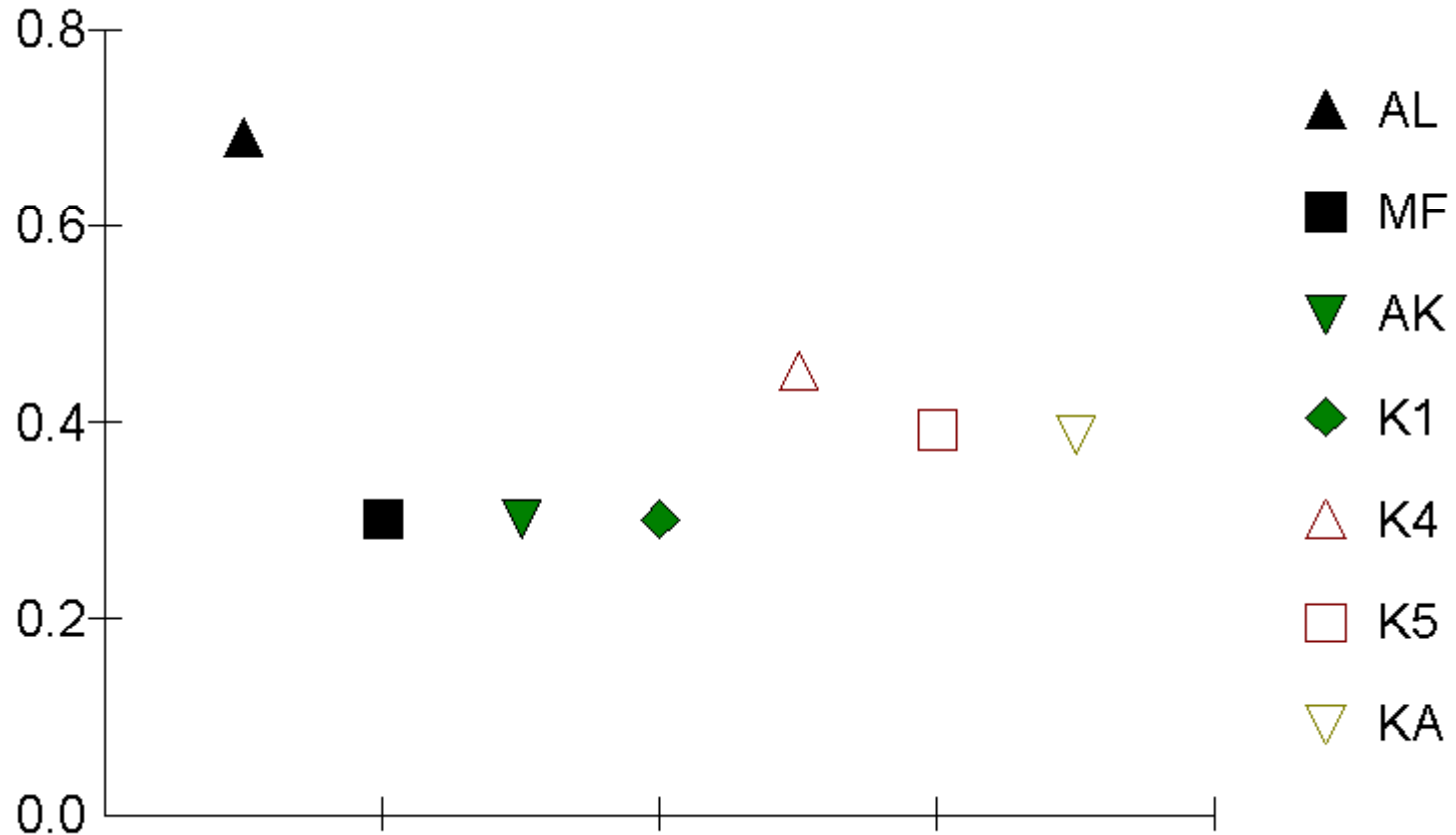
K4



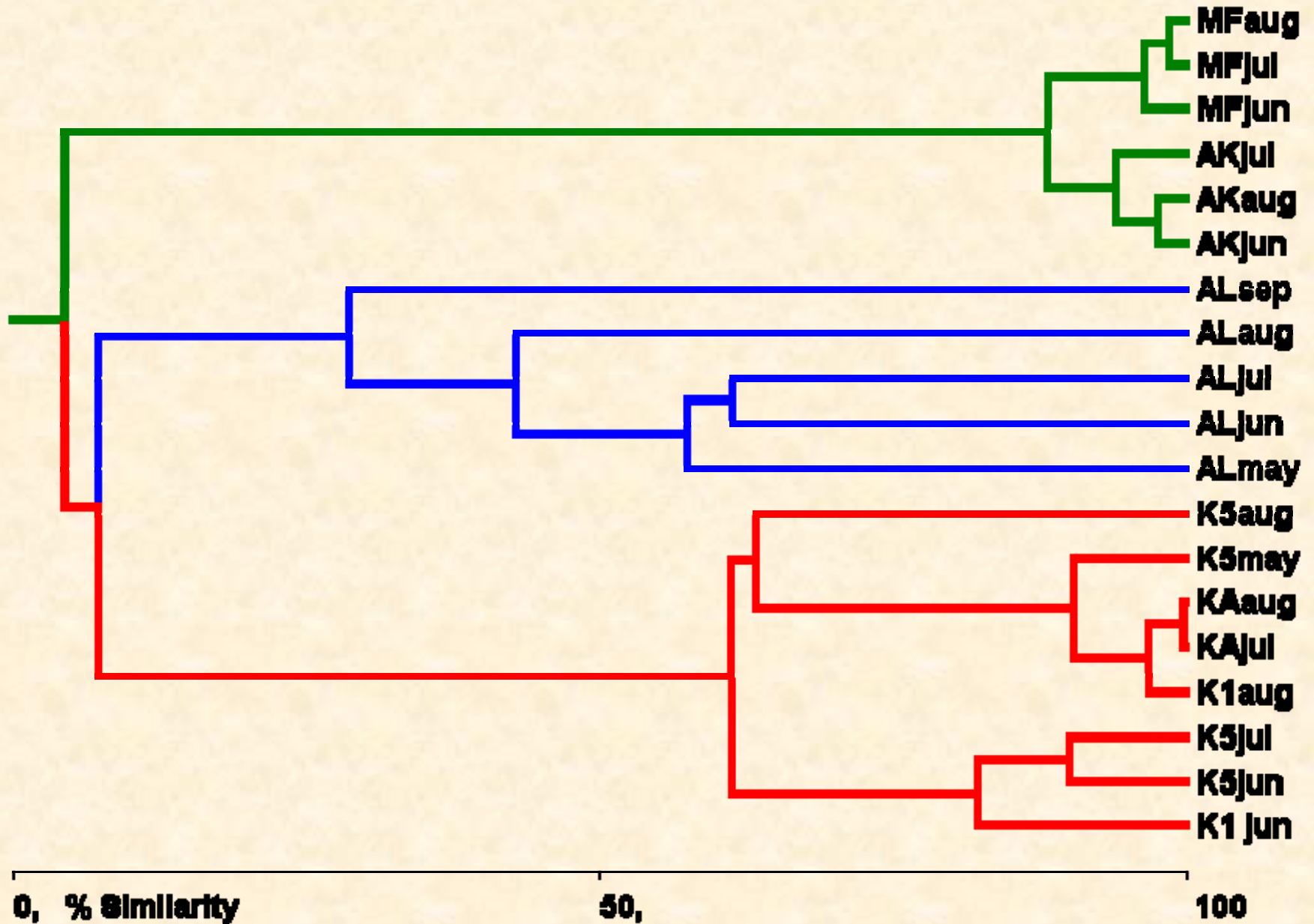
Tenebrionidae abundance (pooled samples)



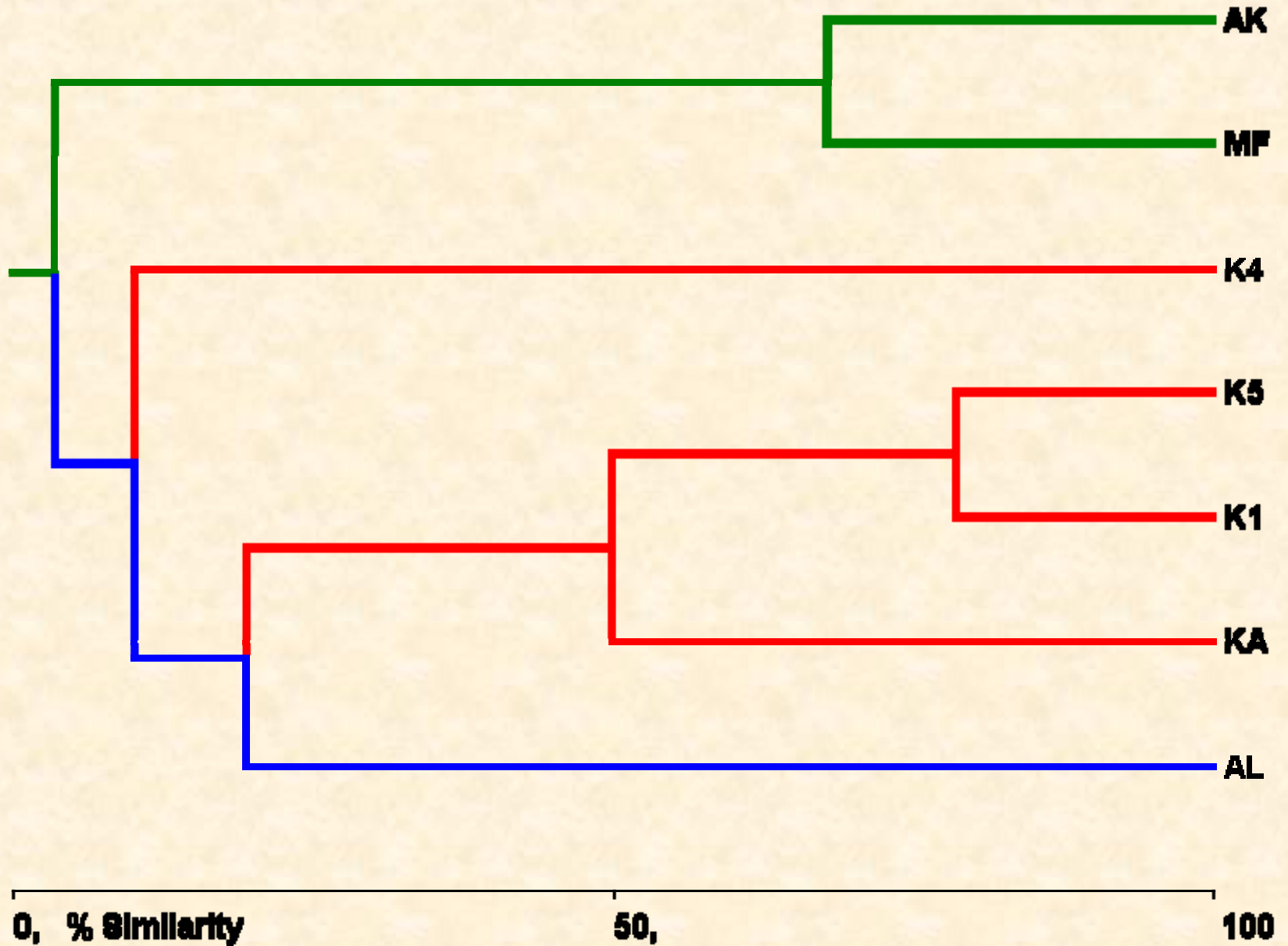
Tenebrionidae diversity (pooled samples)



Tenebrionidae (clustering of monthly samples)



Tenebrionidae (pooled samples per station)



Presence of Isopoda per Biotope

| | AL | MF | AK | KA | K1 | K4 | K5 |
|------------------------------------|--------------------|-------------------|----|----------------|----|---------------|----|
| <i>Armadillidium kalamatense</i> | Widely Distributed | | | | | | |
| <i>Orthometopon dalmatinum</i> | Widely Distributed | | | | | | |
| <i>Porcellio obsoletus</i> | Widely Distributed | | | | | | |
| <i>Trichoniscus pusillus</i> | | Coniferous Forest | | | | | |
| <i>Porcellio peloponnesius</i> | | Mainly in Forests | | | | | |
| <i>Trachelipus palustris</i> | | Mainly in Forests | | | | | |
| <i>Ligidium euboicum</i> | | Mainly in Forests | | | | | |
| <i>Armadillidium tripolitzense</i> | Open Biotopes | | | Open Biotopes | | Open Biotopes | |
| <i>Porcellionides pruinosus</i> | | | | Burnt Biotopes | | | |

Legend



Widely Distributed



Coniferous Forest



Mainly in Forests

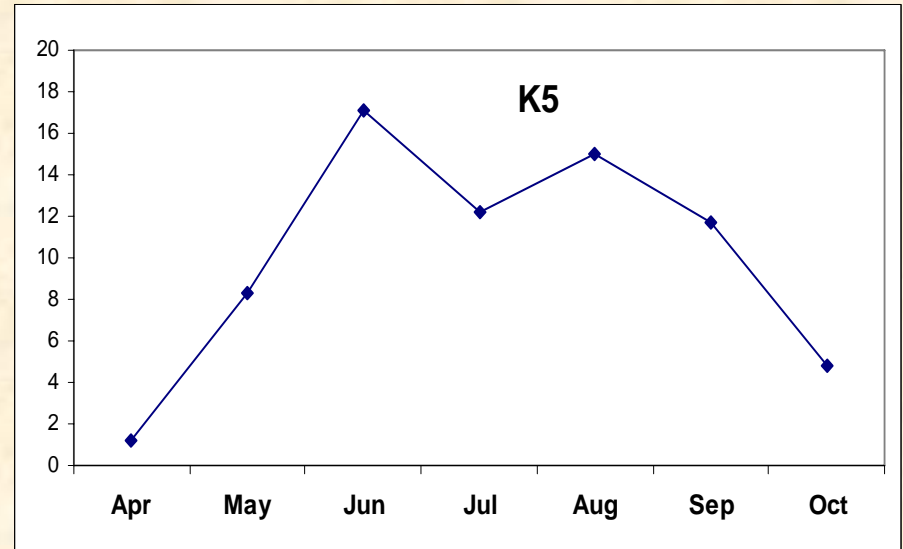
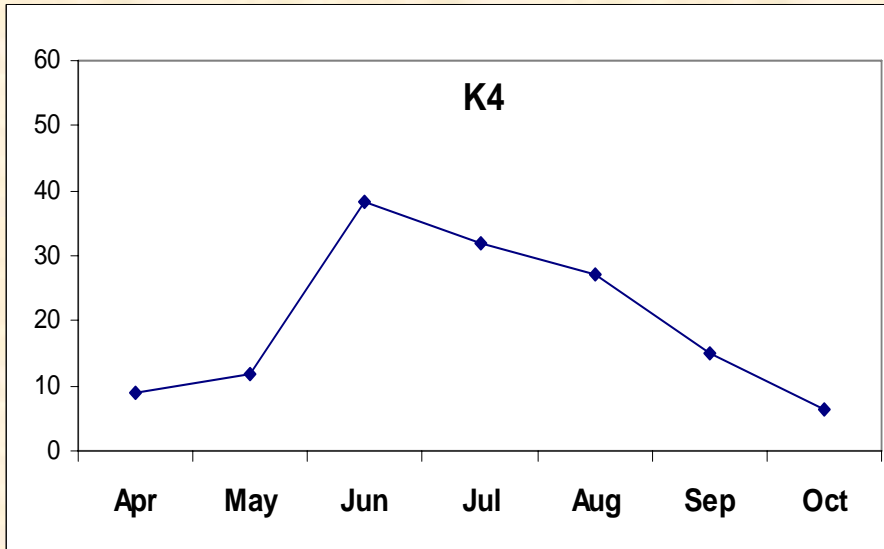
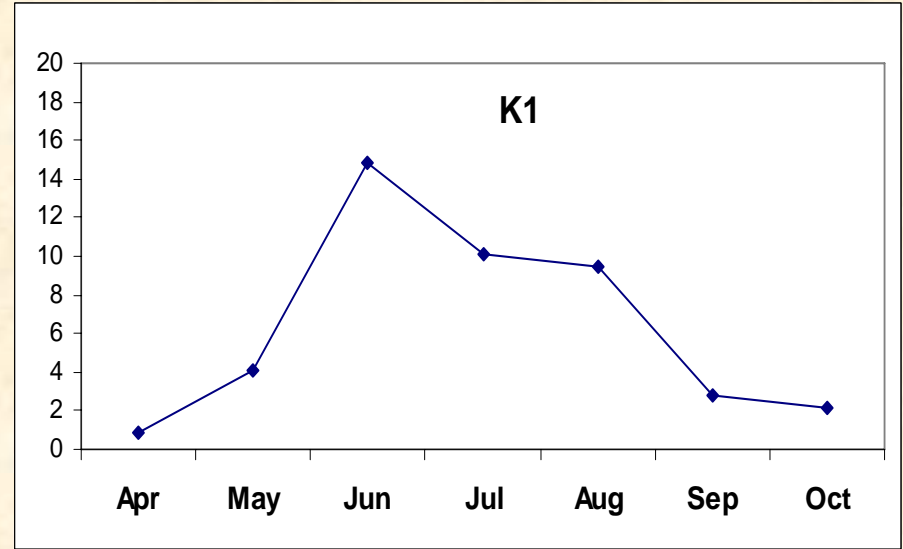
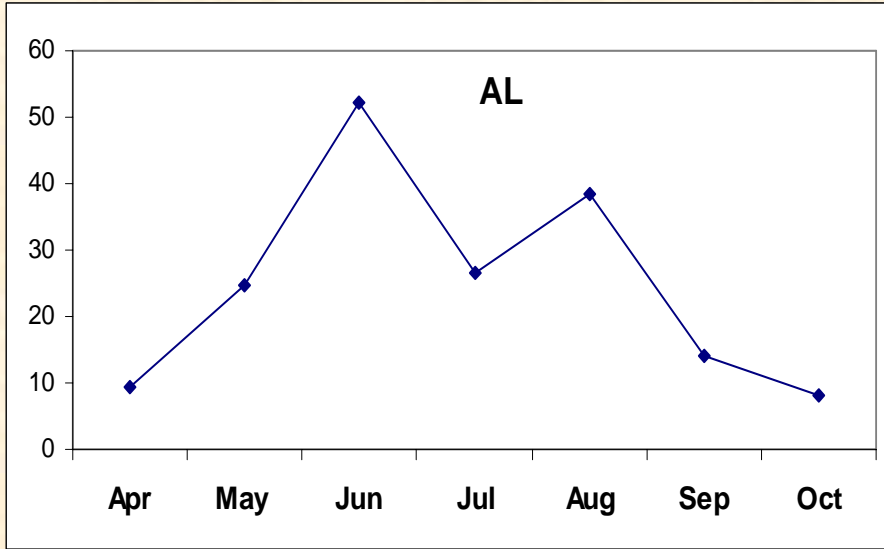


Open Biotopes

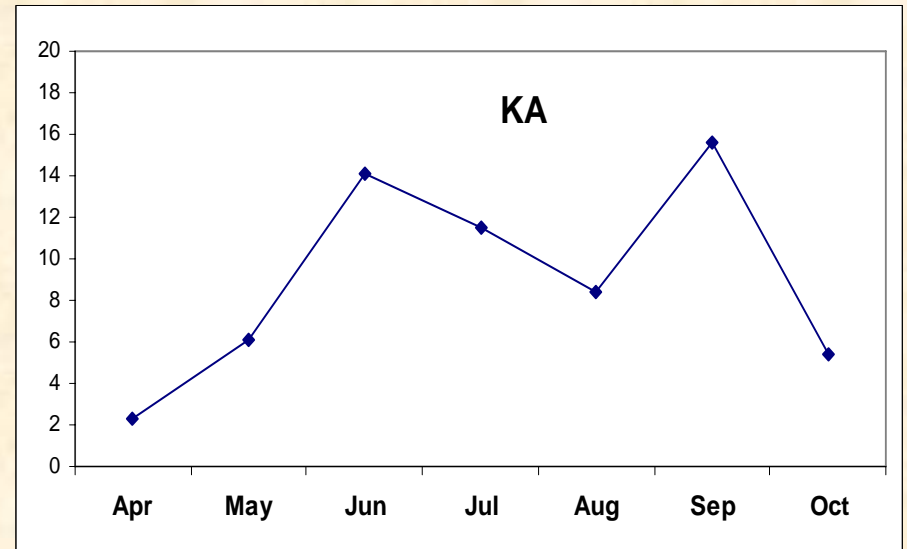
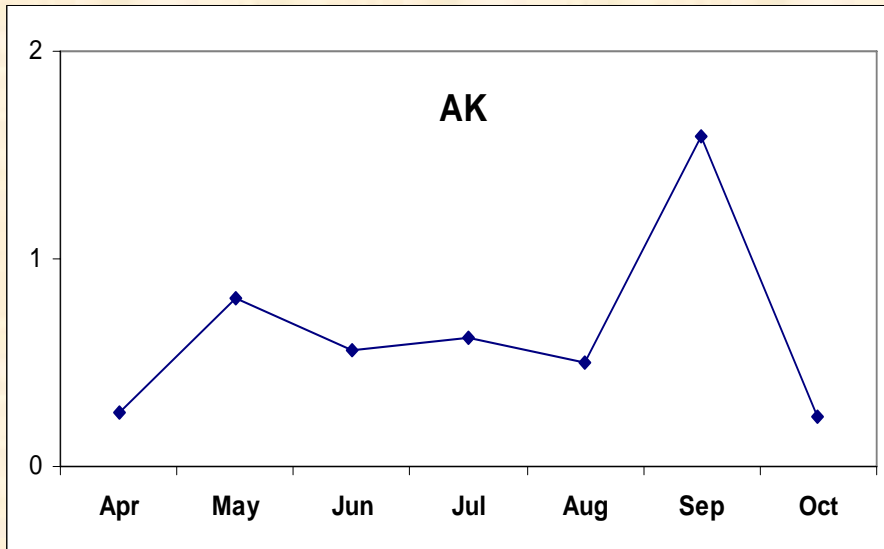
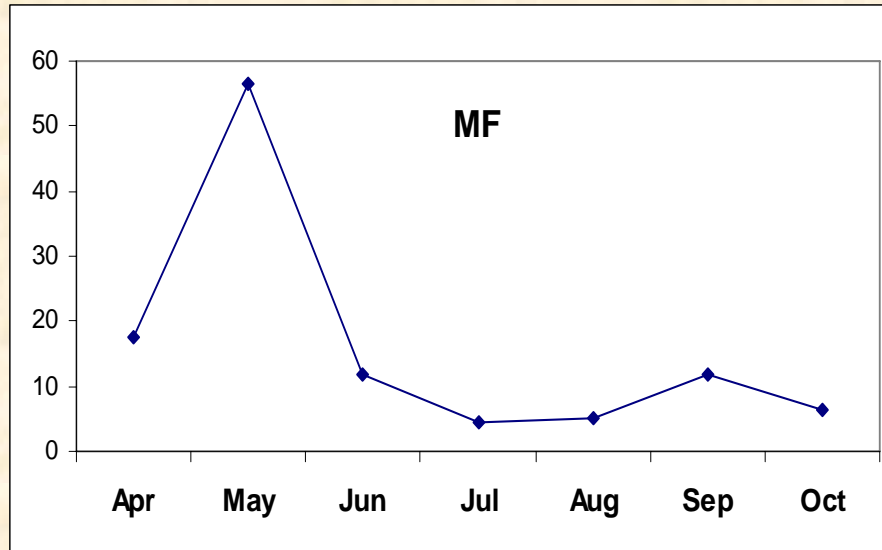


Burnt Biotopes

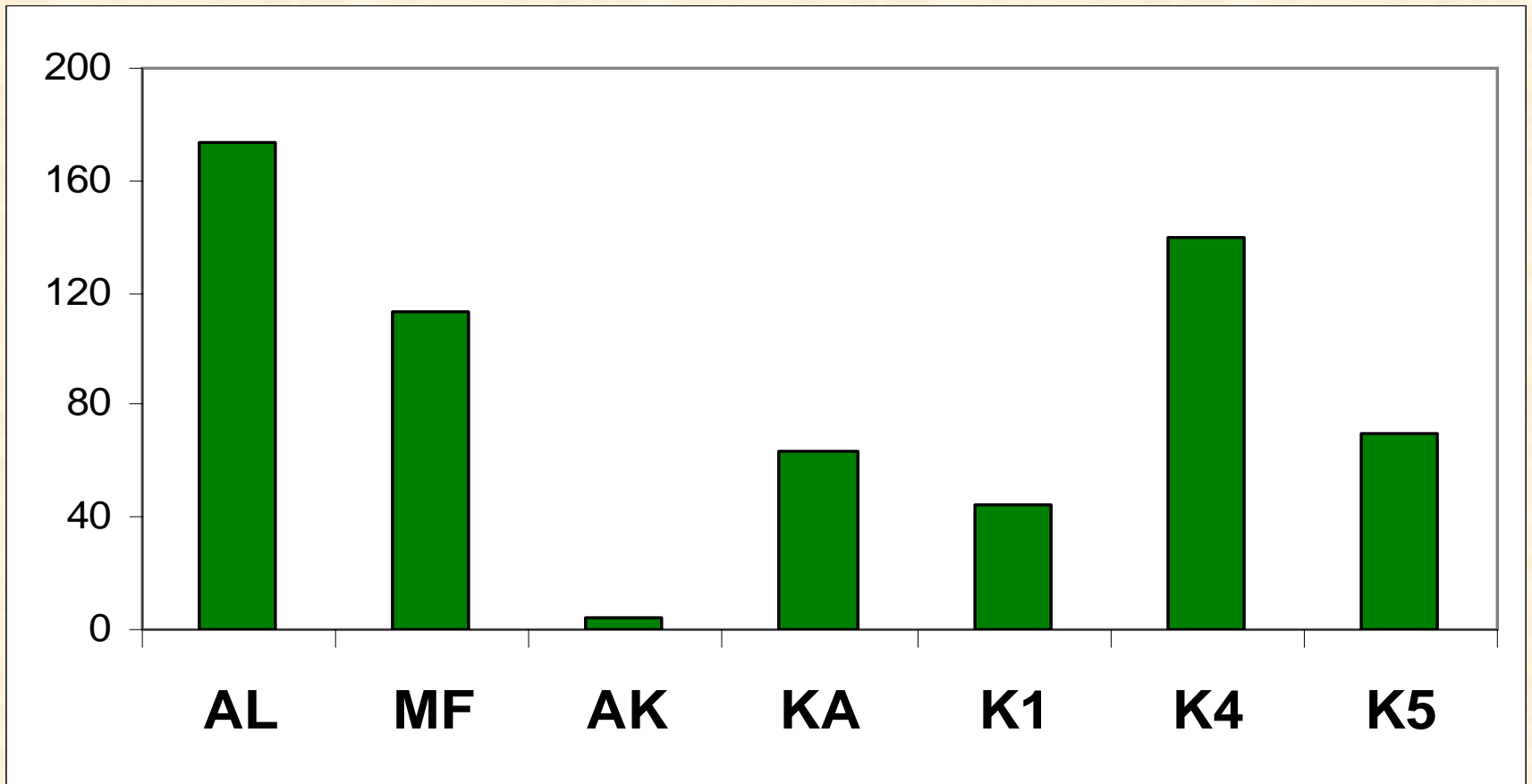
Isopoda abundance per month



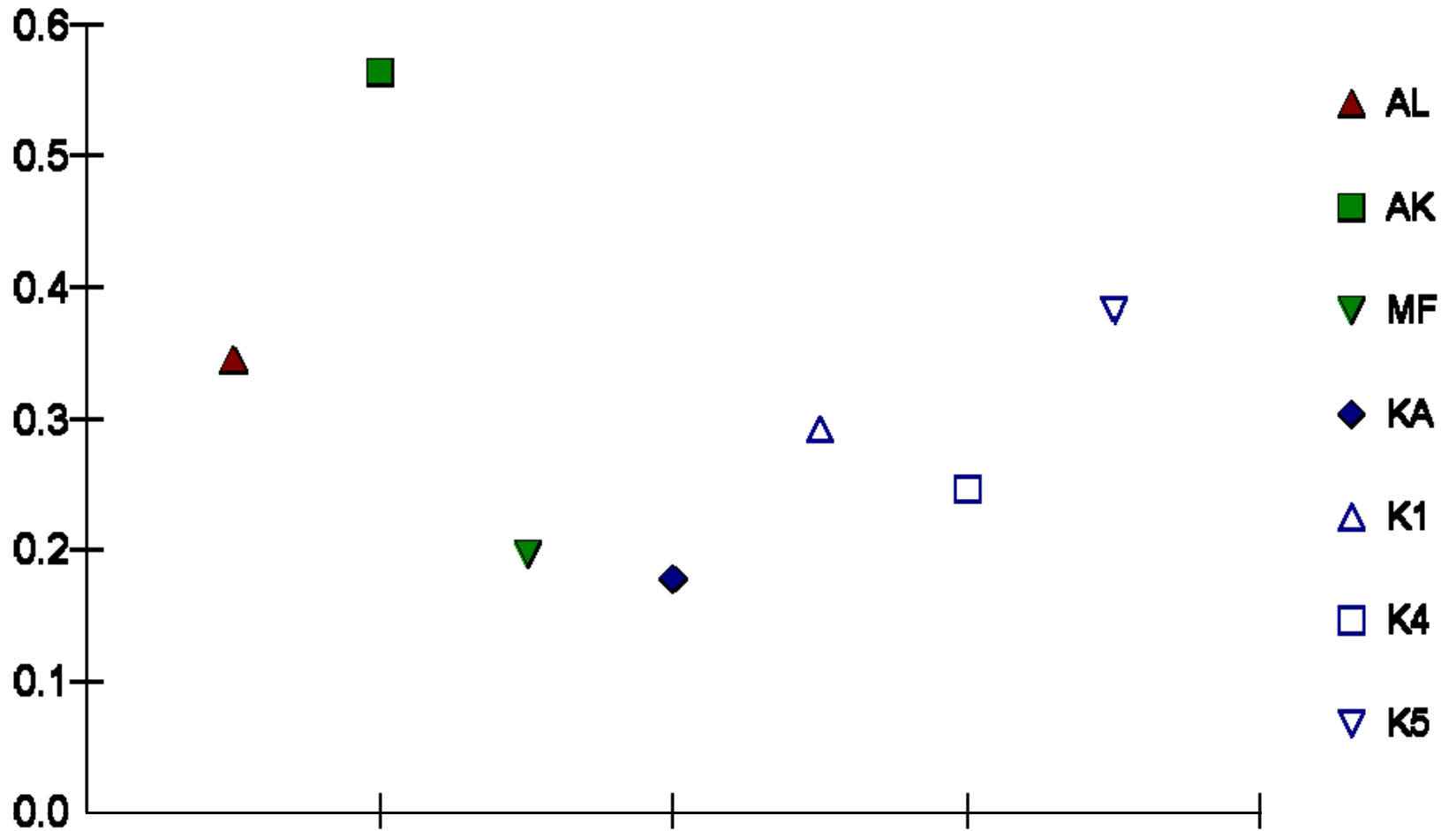
Isopoda abundance per month



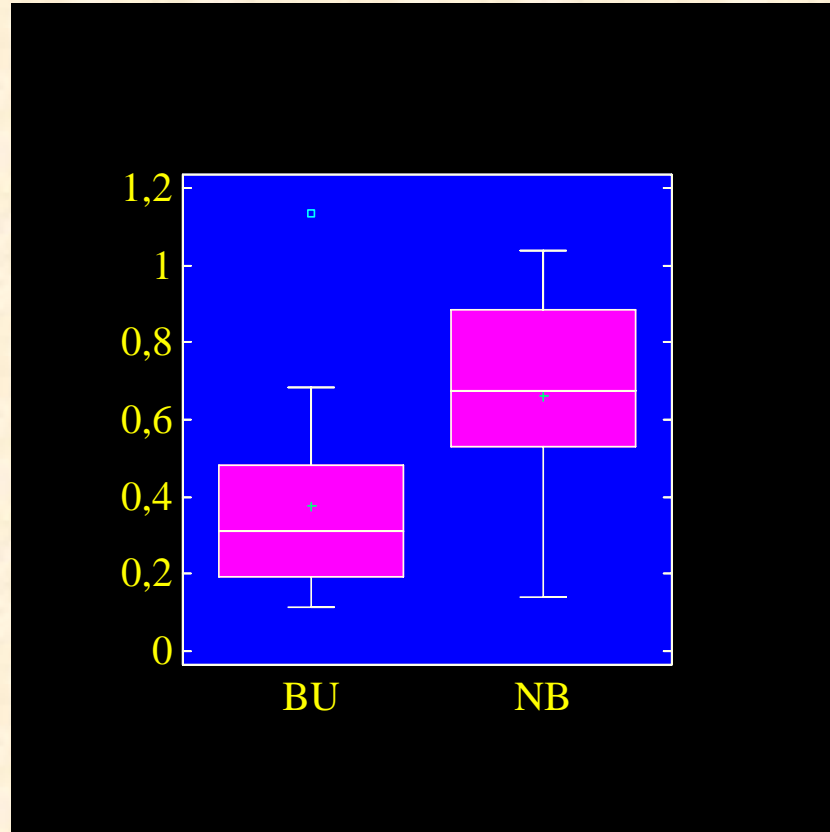
Isopoda abundance (pooled samples)



Isopoda diversity (pooled samples)

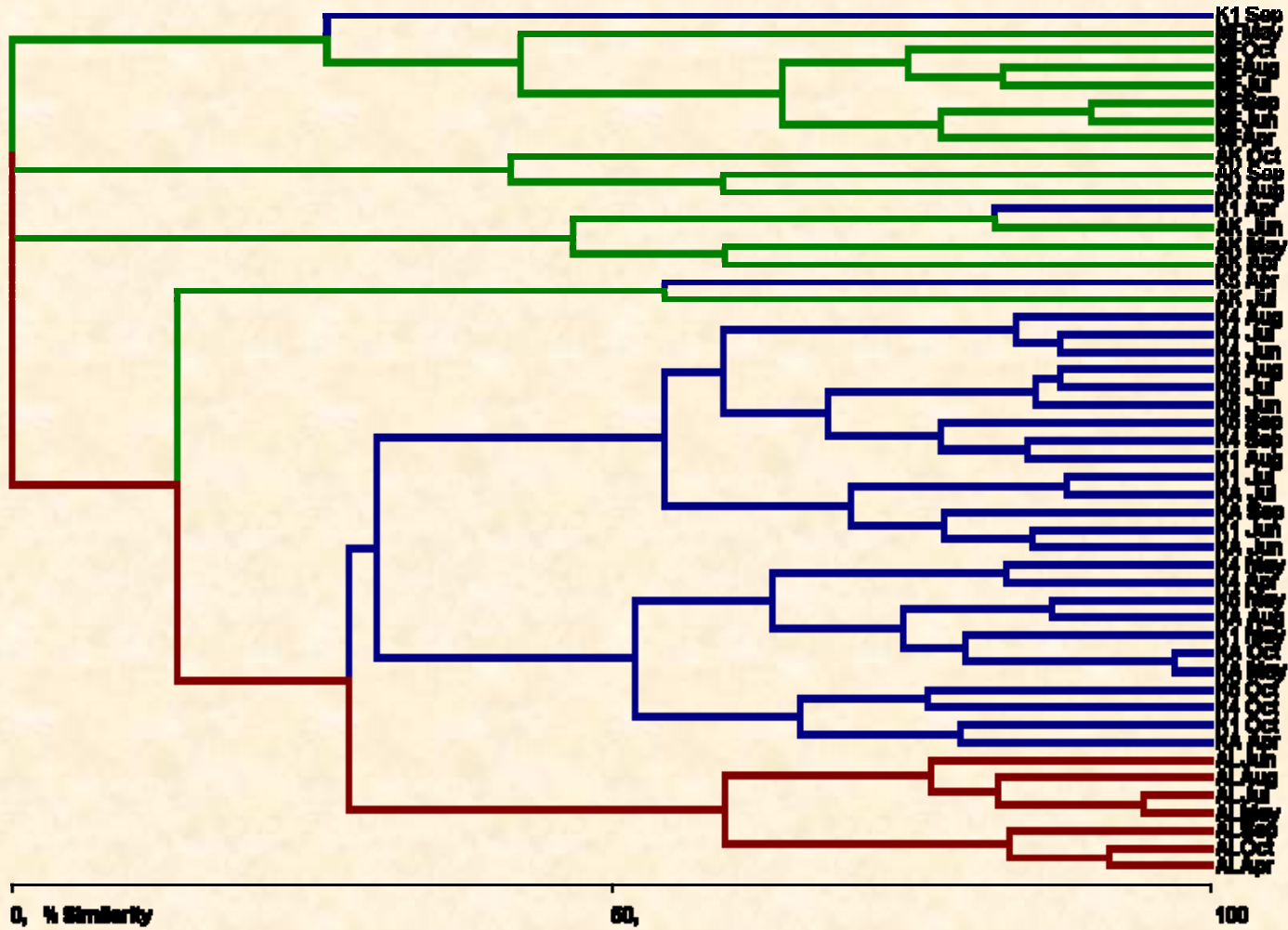


ANOVA of diversities (Shannon index) ISOPODA (June)

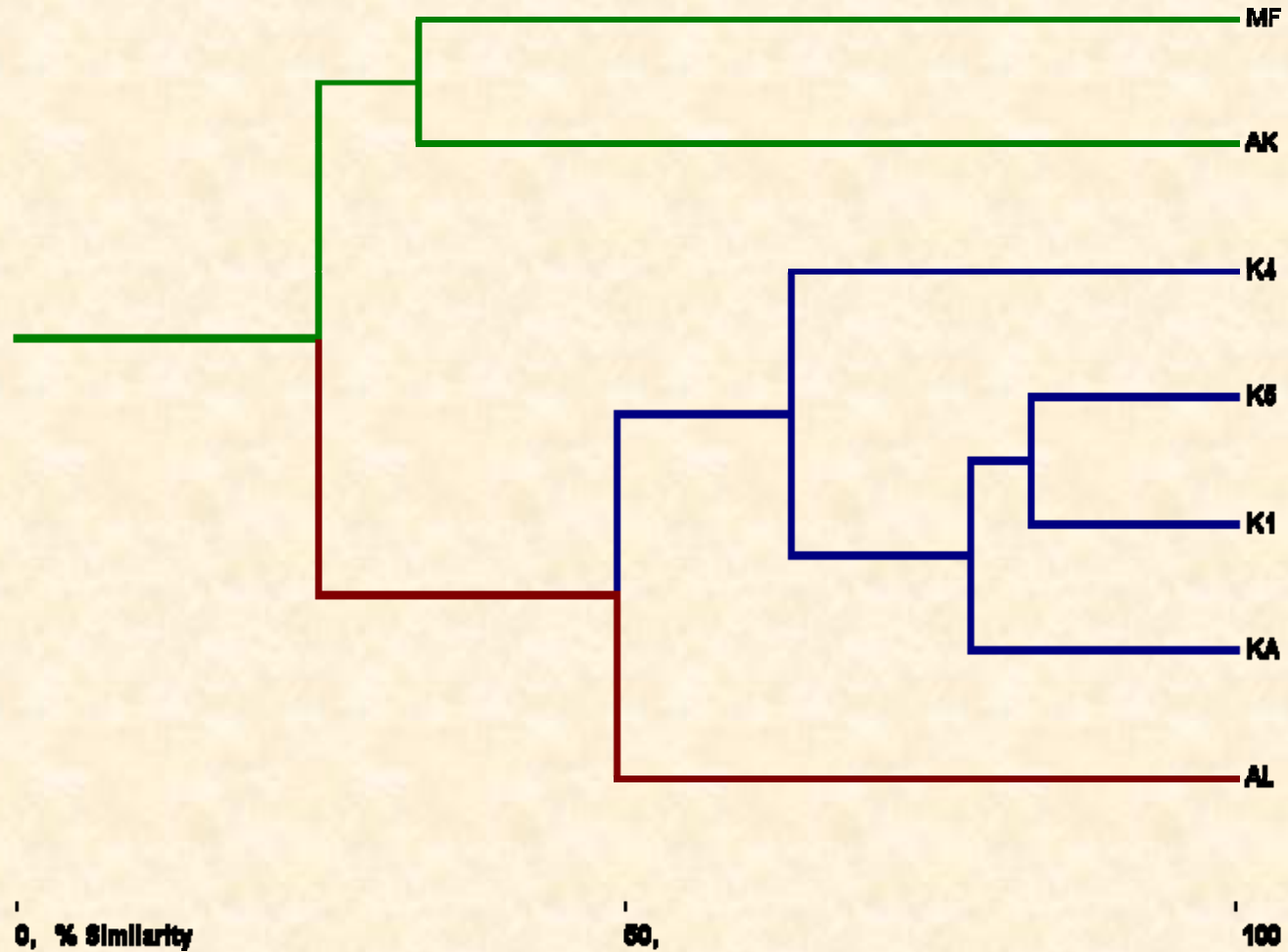


$F = 6,55$ $P = 0,017$

Isopoda (clustering of monthly samples)



Isopoda (pooled samples per station)



Conclusions

- **Highest abundance in sub-alpine habitat**
- **The pine forest has the lowest abundance**
- **Burnt habitats are not poorer than non-burnt**
- **Burnt habitats are generally more diverse than non-burnt (except for the sub-alpine habitat)**
- **The three groups analyzed herein do not show particularly consistent diversity patterns**
- **Open habitats (sub-alpine and burnt) are more similar in community structure**
- **The markedly increased diversity of (the carnivorous) Carabidae in burnt habitats might be due to species coming from other habitats to opportunistically exploit available resources**

Fire does not seem to have significant short- and medium-termed effects on the epigeic invertebrate communities we studied

So, let them burn ?

We must note that there were almost no post-fire human activities in these habitats

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