



**Taxonomy and biogeography of macrofaunal isopods
of the Pacific abyssal fauna relevant to the CCZ**

Stefanie Kaiser

SENCKENBERG
world of biodiversity



Isopoda

Ubiquitous and diverse

Feeding types

parasites,
suspension feeders



detritivor,
foraminiferivor



predators



scavengers

Brökeland et al. 2010

Isopoda

Ubiquitous and diverse

Feeding types

Reproduction mode

Obligate brooders

Distribution restricted ?



Isopoda

Ubiquitous and diverse

Feeding types

Reproduction mode

Obligate brooders

Differences in mobility



Riehl & Kaiser 2012, Brix et al. 2014

Different suborders

Present in abyssal collection

Asellota



>90%
ca. 15 families

Cymothoidea



Tropical to temperate
shallow water

Sphaeromatoidea

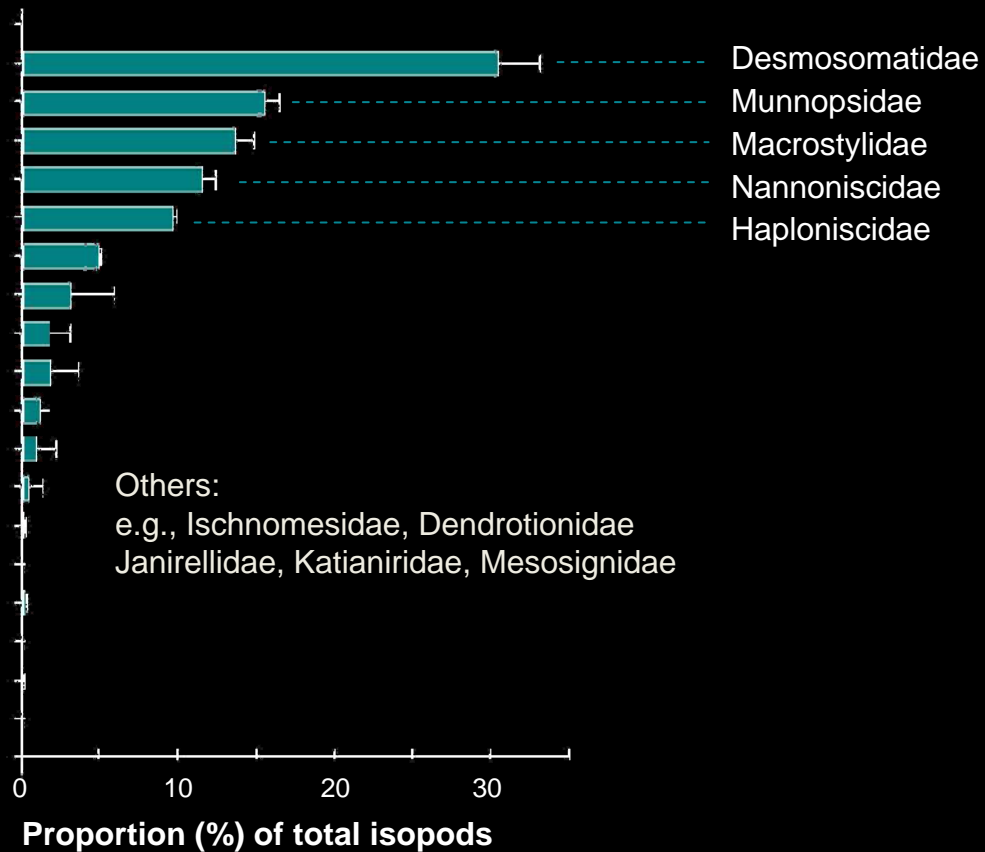


Southern temperate and polar shelves

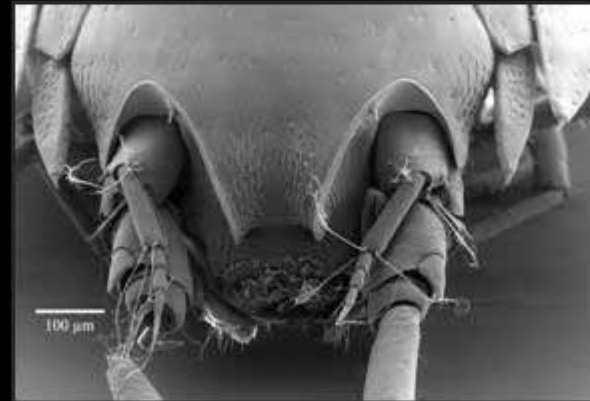
Valvifera



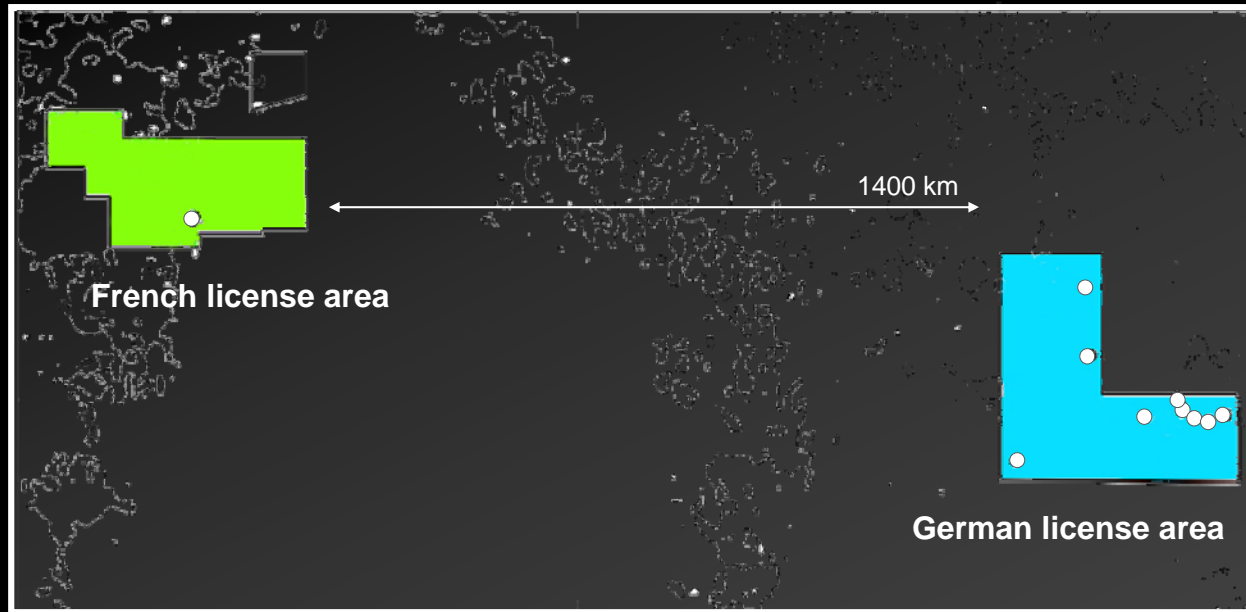
Dominant families relevant to the CCZ



Sample processing and species discrimination



Distribution of data



Genetic/morphological
measures

Diversity & distribution

Local to regional scale



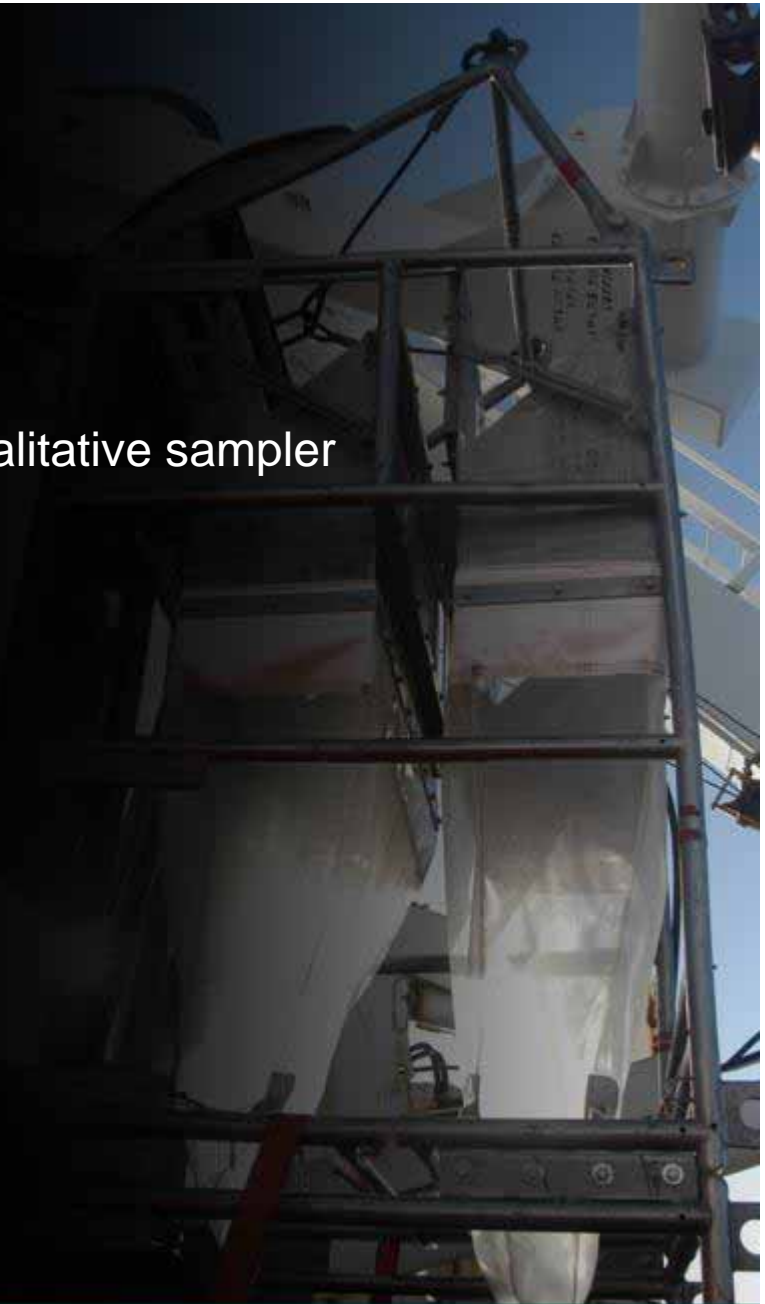
modified from Janssen et al. submitted, Kaiser & Brenke, work in progress; Photo: P Bucktrout

Sampling

Epibenthic sledge vs. box core



Quantitative vs. qualitative sampler
Supra- and epinet
Modifications



Sample processing

Macrofauna

Preserving for morphological & genetic analyses:

- Careful sieving with cold sea water (500 & 300 μm mesh)
- Fixing in pre-cooled (-20°C) absolute **96% EtOH** or DESS (Yoder *et al.* 2006)
- Exchange of EtOH after 24h max.



Photos: D Barnes, S Kaiser, I Mohrbeck, S Keller

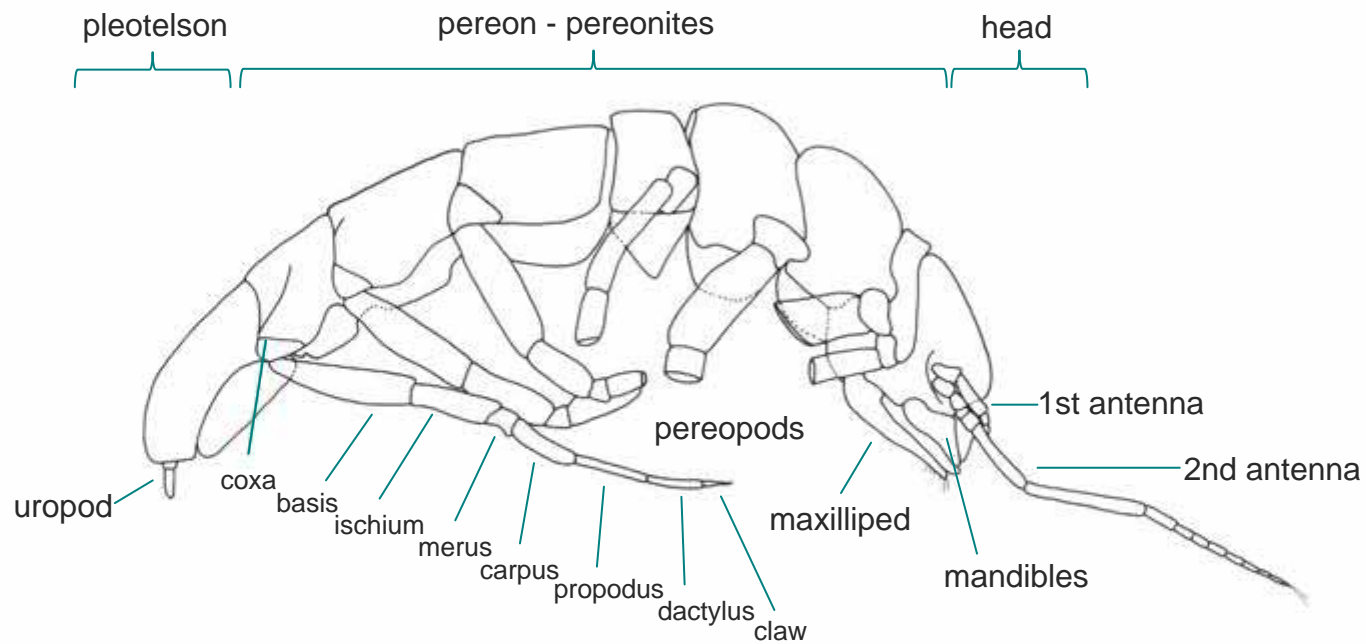
Species discrimination

- (Stereo-) microscope
- Sorting on ice
- Preparing slides: glycerine, e.g. methyl-green stain
- Confocal, SEM



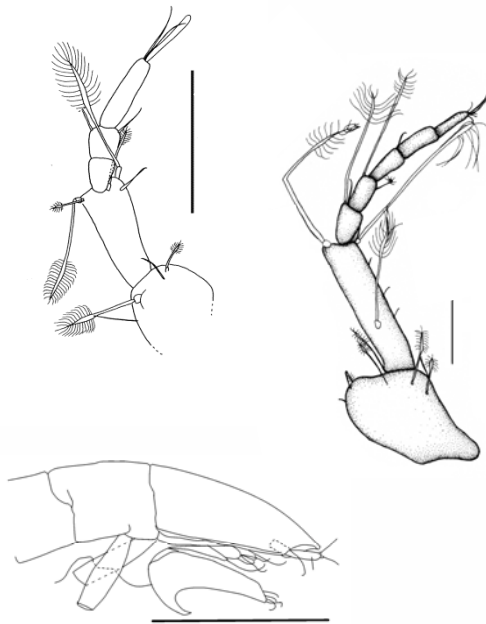
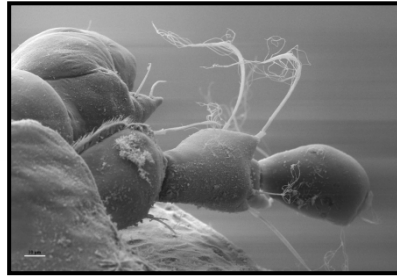
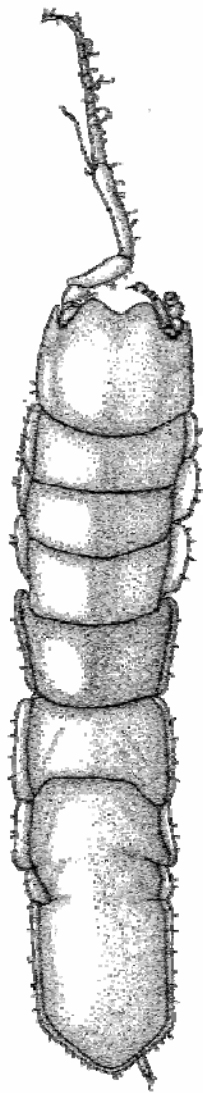
from Kaiser & Marner 2012; Riehl et al. 2014

Isopod body parts



Nannoniscidae

12 genera
>80 species described

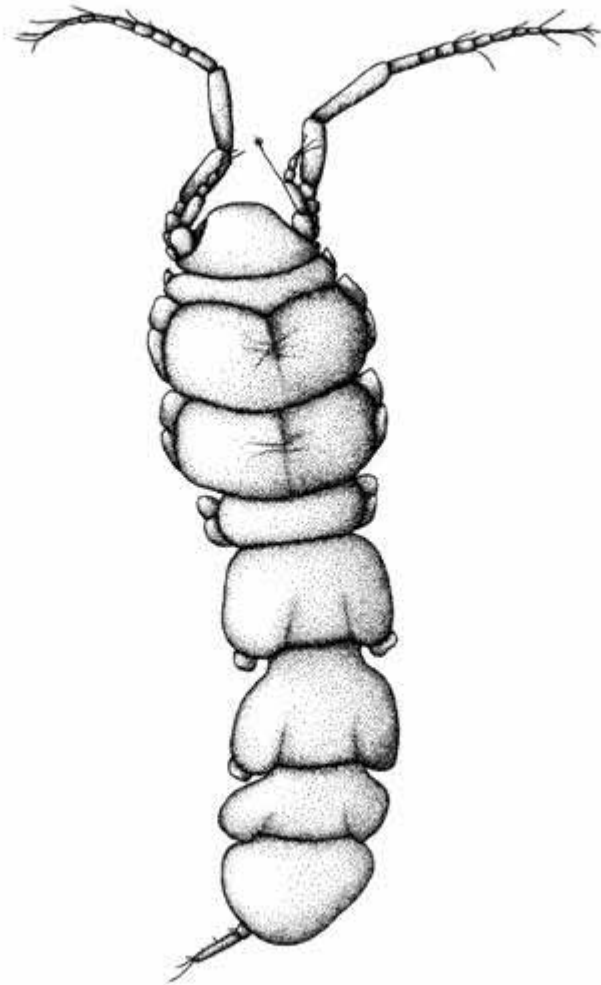


Important characters:

1st antenna,
1st pereopod
ventral spines,
fused pereonites

Dominant: *Nannoniscus*, *Hebefustis*

Also present: *Thaumastosoma*, *Micromesus*, etc.



Desmosomatidae

2 subfamilies, 20 genera
>130 species described

Important characters:
pleotelson:
posterolateral spines,
pereopod I

Dominant: *Eugerdella*, *Mirabilicoxa*, *Prochelator*
also present: *Chelator*, *Disparella*, *Whoia*

Preparation for genetic analyses

Morphological ID ←

Photo, database
(voucher #, metadata)

Dissect 1-3 pereopods
(onboard)
pereopod 2 onwards,
one-sided

Voucher for
morphological ID &
species description

COI, 16S, HTS
also 18S, H3 for
phylogenetic studies

reverse

Vouchering

Taking more informative pictures

Family/ genus



500 µm

Subfamily



Subfamily

0.5 mm



Family/ genus?

Family/ genus?



Family/genus

0.5 mm



Vouchering

Taking more informative pictures



Pereopod 1

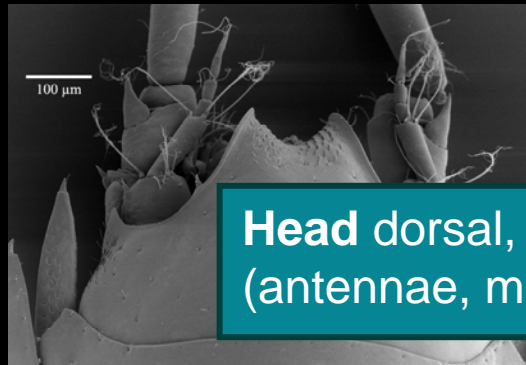


Overview

Dorsal & lateral (pereonites 5-7 dorsal and lateral)



Pleotelson dorsal, lateral and ventral

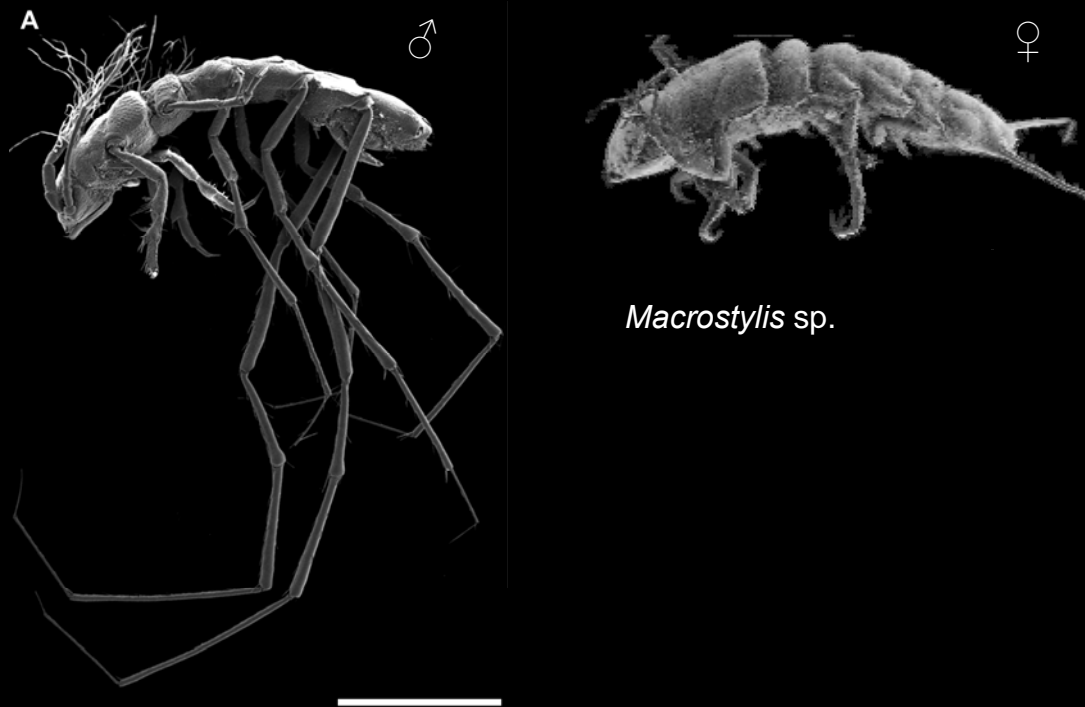


Head dorsal, lateral, ventral (antennae, mouthparts)



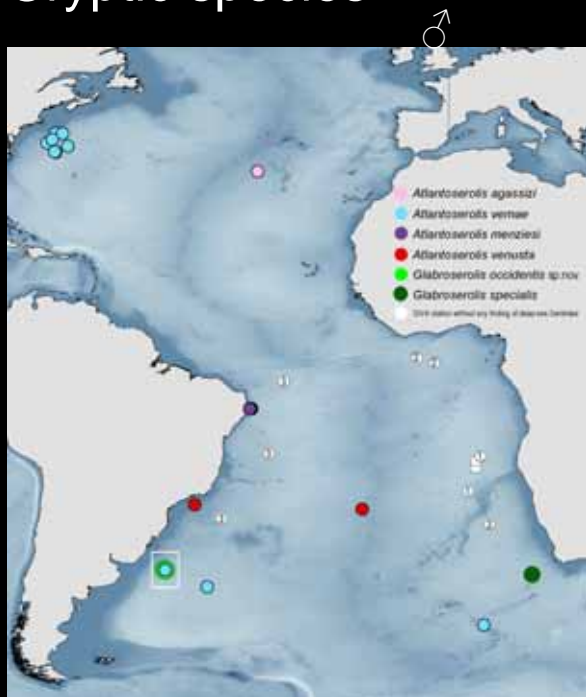
Taxonomy – constraints

- Photographs not sufficient for species level ID
- Hardly any taxonomic keys (limited to certain families)
- Bad condition of nodule material
- Sexual dimorphism: assigning male and female



Taxonomy – constraints

- Photographs not sufficient for species level ID
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- Bad condition of nodule material
- Sexual dimorphism: assigning male and female
- Cryptic species



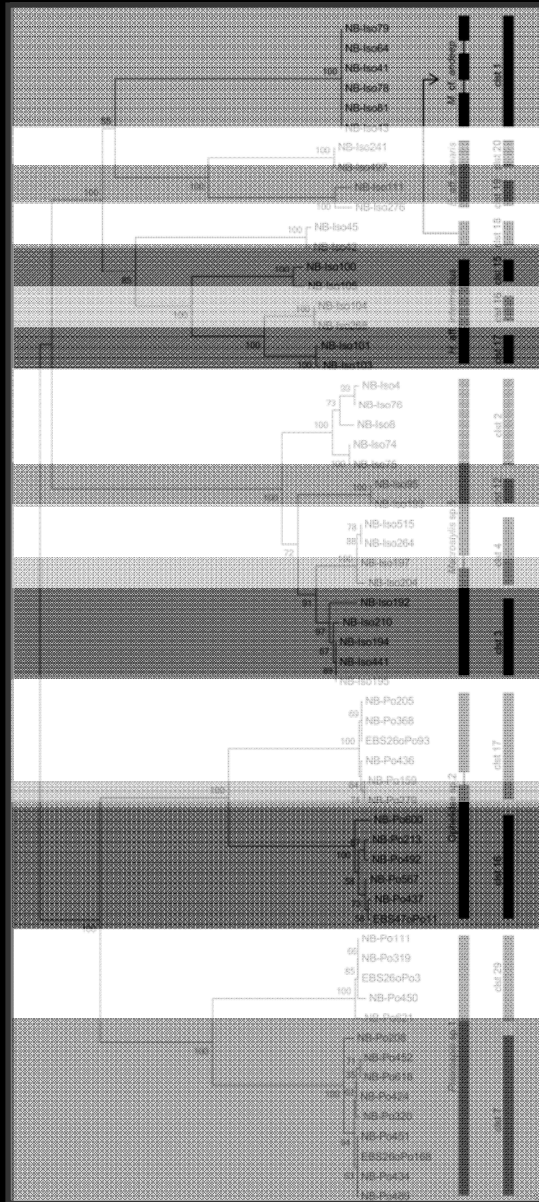
Atlantoserolis vema Menzies, 1962

Cryptic species

Isopoda

8 morpho species vs.

15 molecular taxonomic units



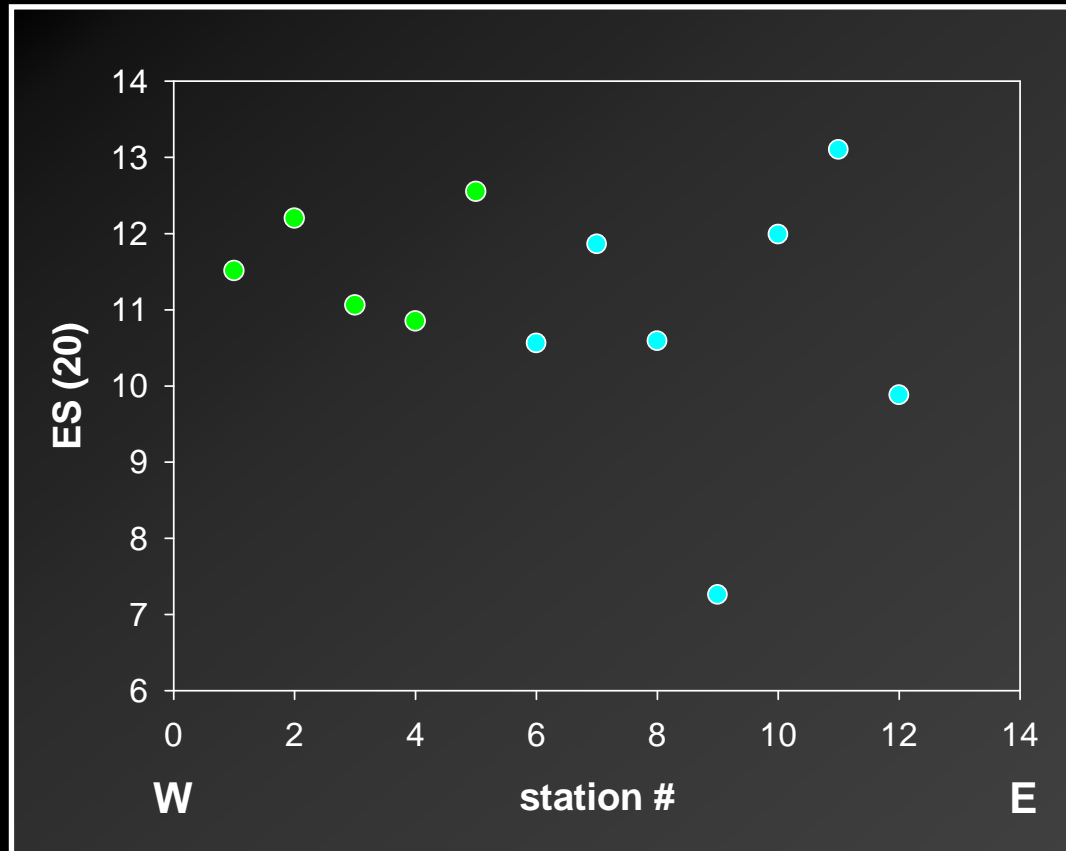
Biodiversity and distribution

of CCFZ Isopoda



Diversity from local to regional scales

Differences between sites and areas

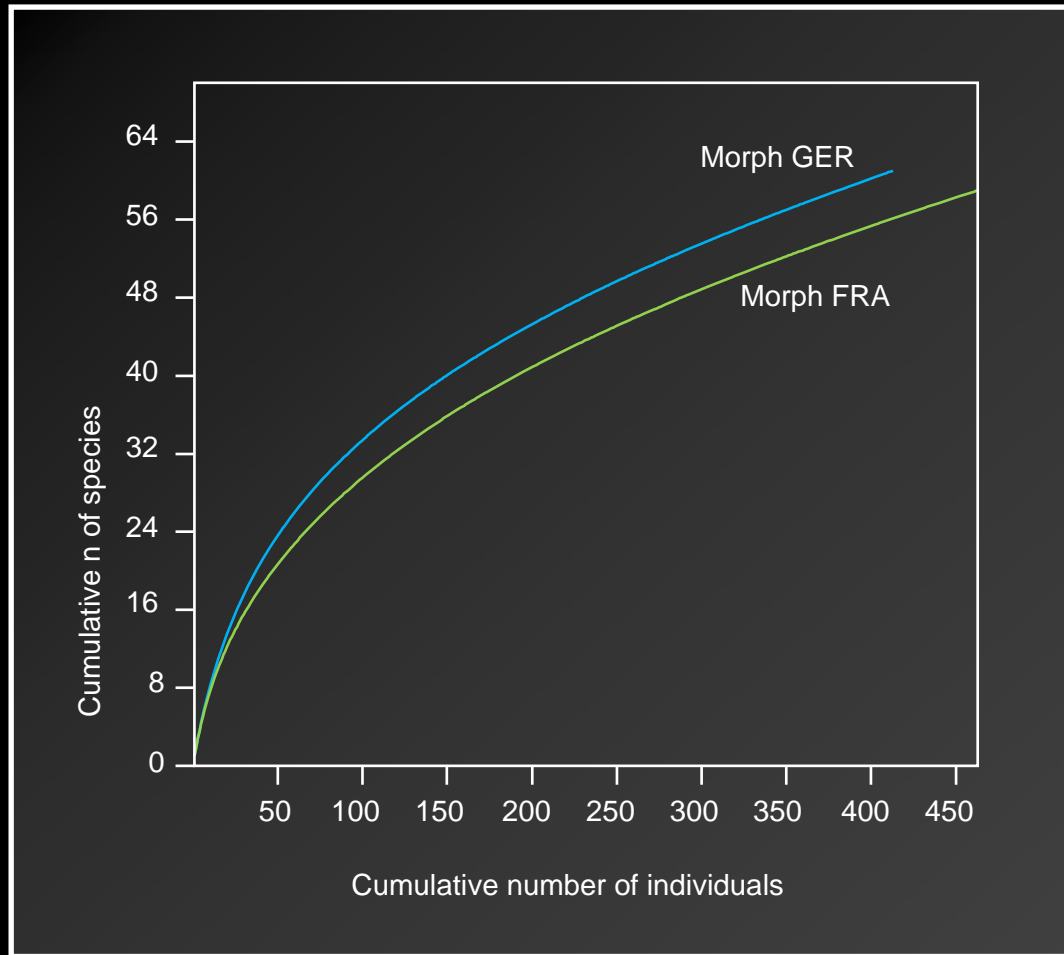


One-way ANOVA $p = 0.346$



Diversity from local to regional scales

Differences between sites and areas



Rate of novelty

5 species described (from the CCFZ)
Genera and families new to science



 Zootaxa 2783: 1–20 (2011)
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Article

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Description of two new species of munnopsid isopods (Crustacea: Isopoda: Asellota) from manganese nodules area of the Clarion-Clipperton Fracture Zone, Pacific Ocean

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Article

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New species of *Hebefustis* Siebenaller & Hessler 1977 (Isopoda, Asellota, Nannoniscidae) from the Clarion Clipperton Fracture Zone (equatorial NE Pacific)

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Urstyliidae – a new family of abyssal isopods (Crustacea: Asellota) and its phylogenetic implications

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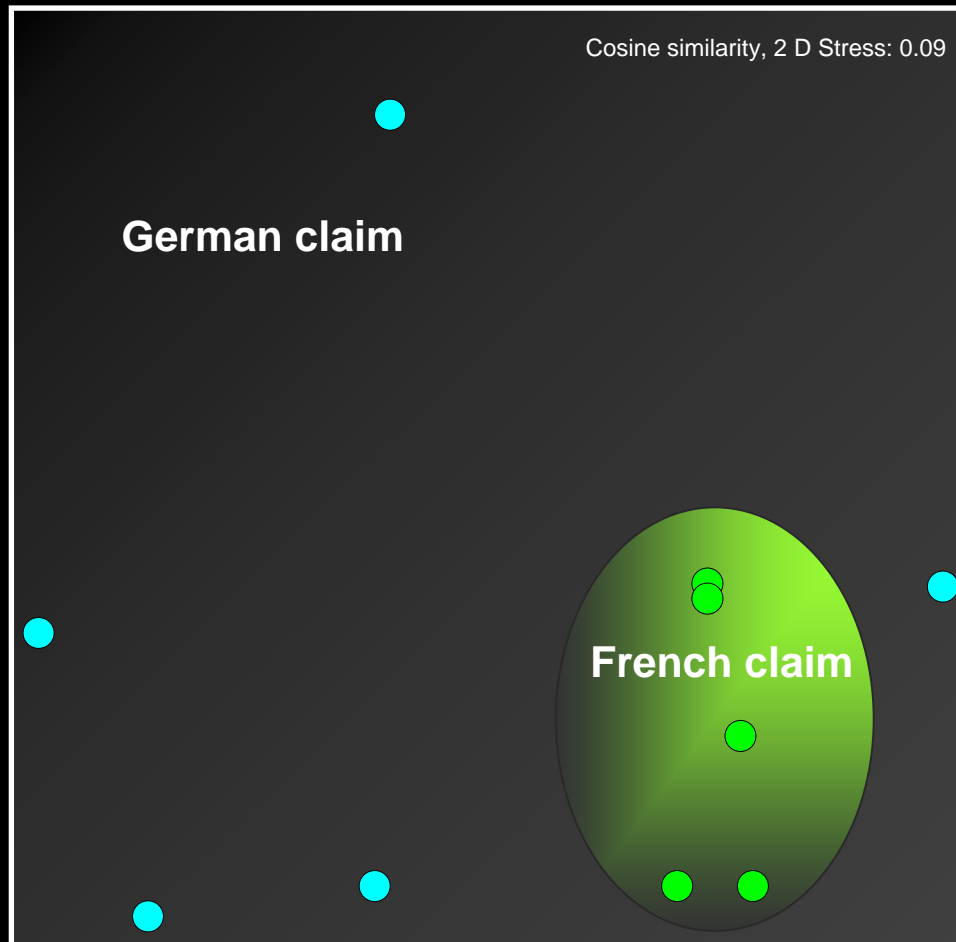
²Marine Invertebrates, Australian Museum, 6 College Street, Sydney, NSW 2010 Australia

³A.V. Zhirmunsky Institute of Marine Biology, FEB RAS, 17 Palchevskogo Street, 690041; Far East Federal University, Vladivostok, Russia

Taxonomic descriptions crucial for further biogeographic, phylogenic and ecological studies

Variation in species composition

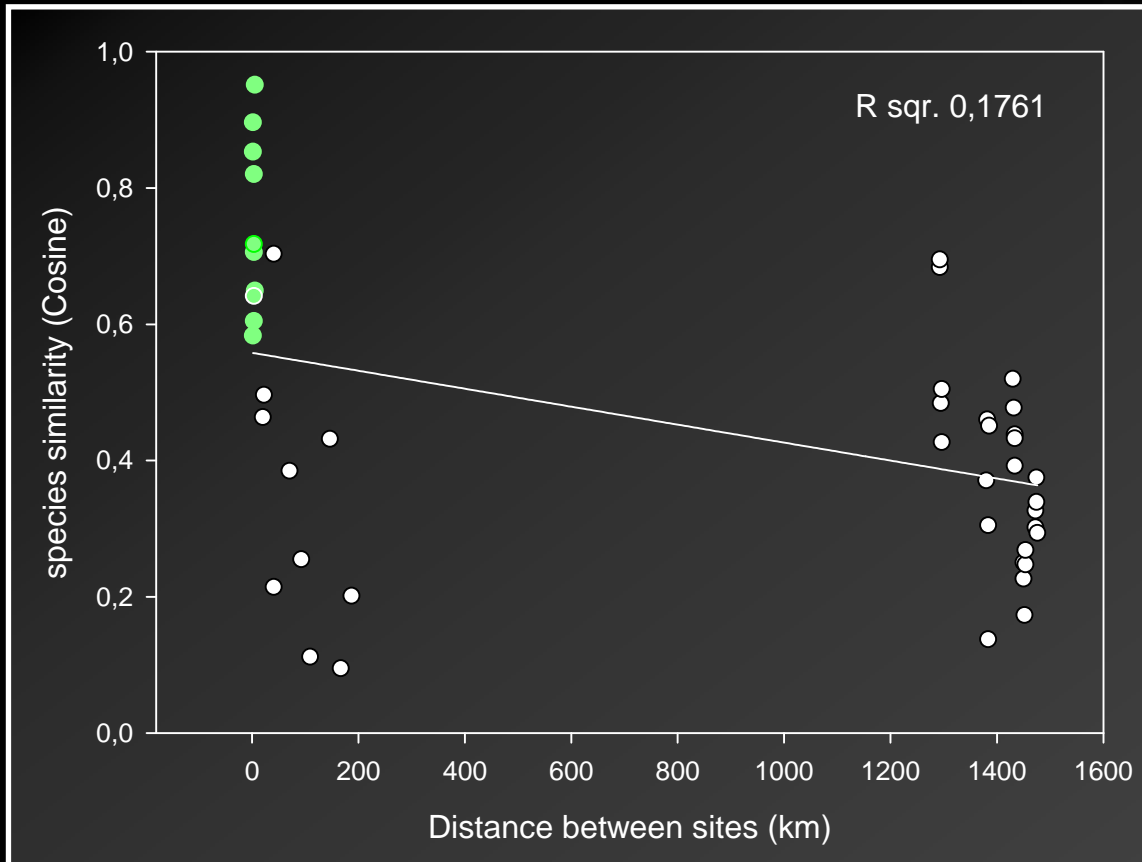
High variability even between close-by stations



Variation in species composition

High variability even between close-by stations

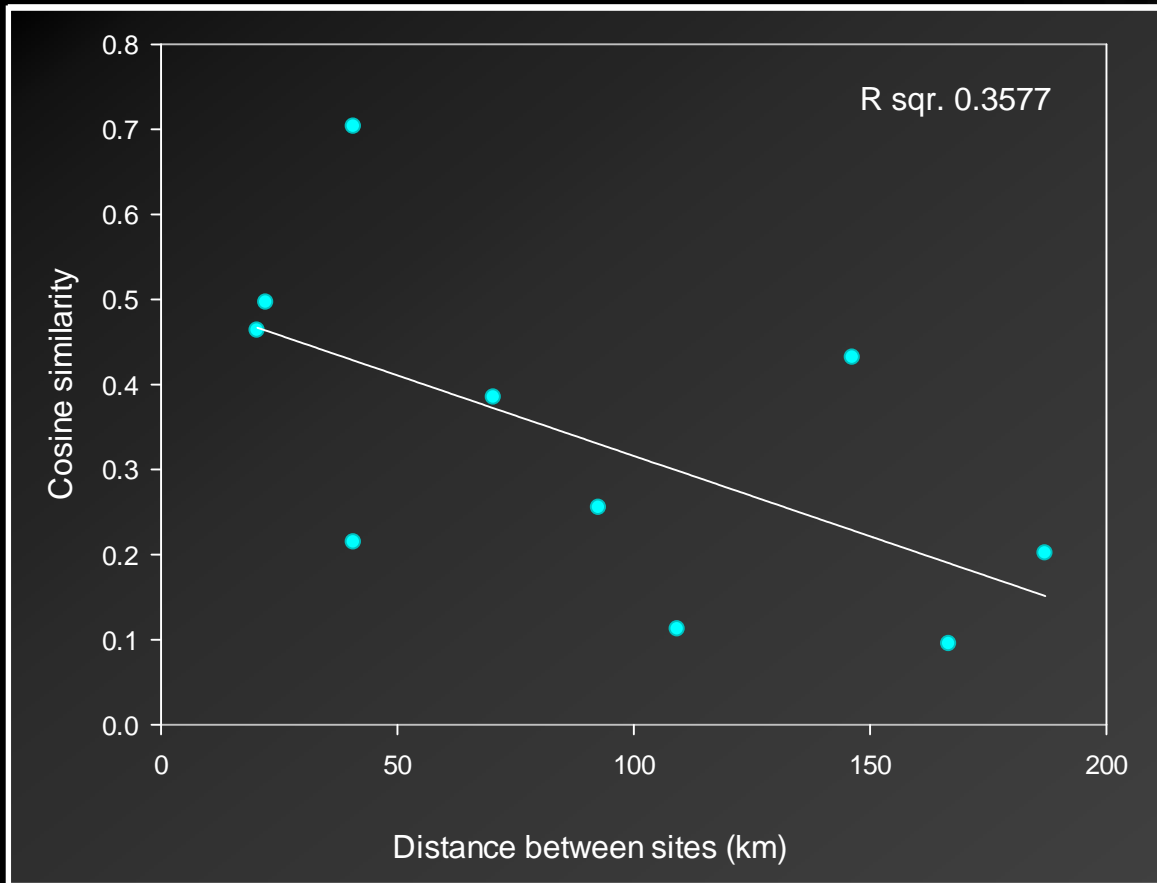
Distance explains differences to some extent



Variation in species composition

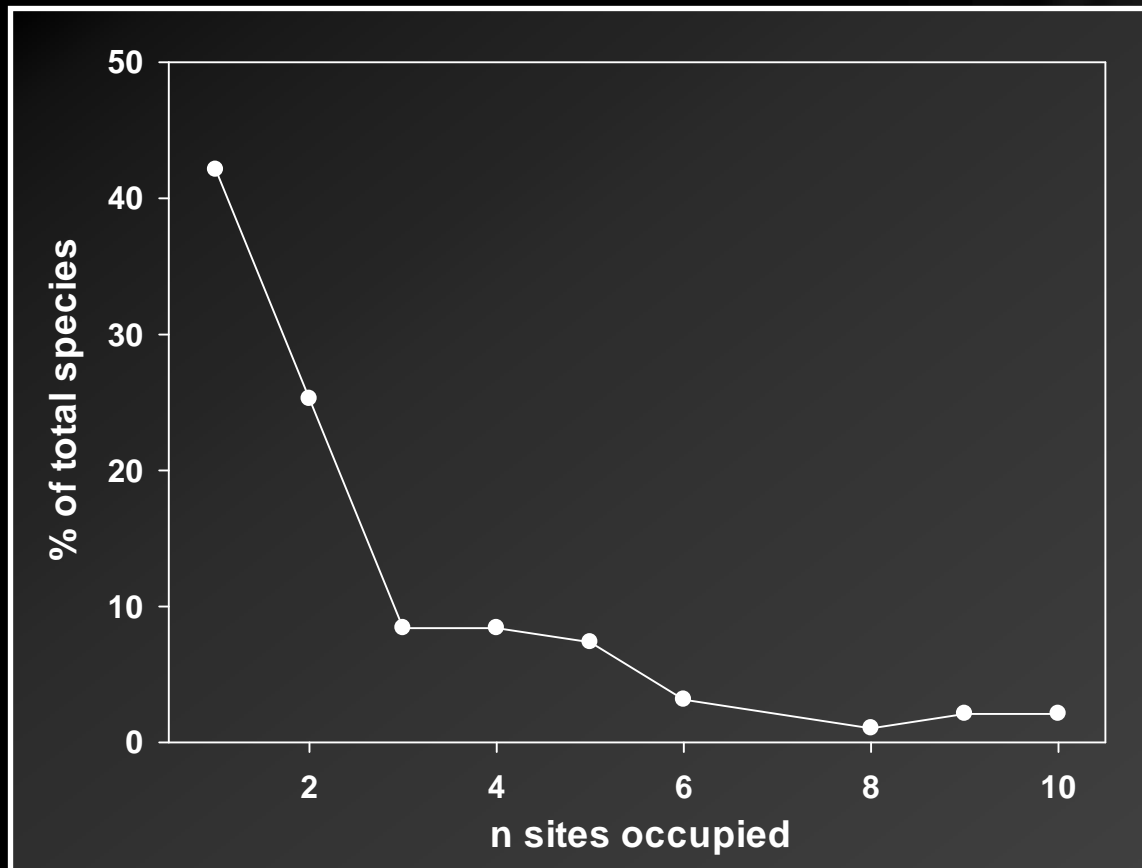
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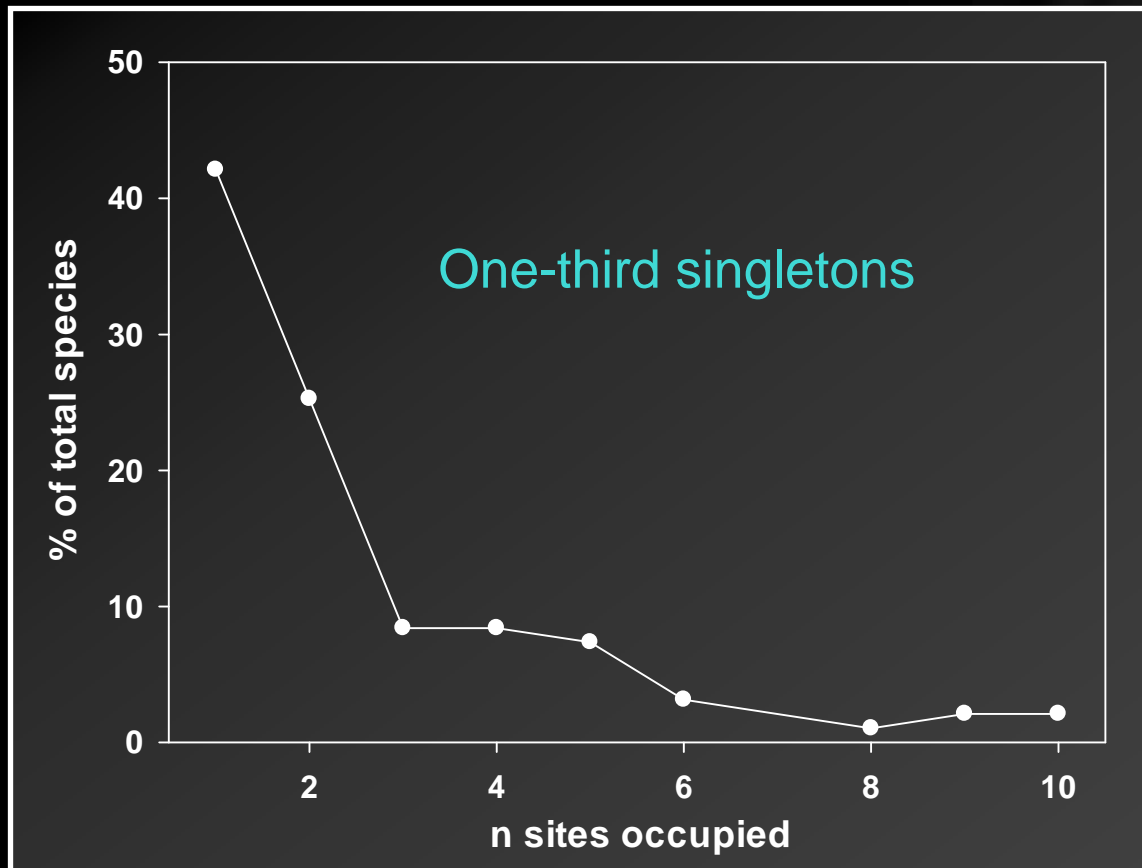
Abundance patterns

High proportion of unique and duplicate species

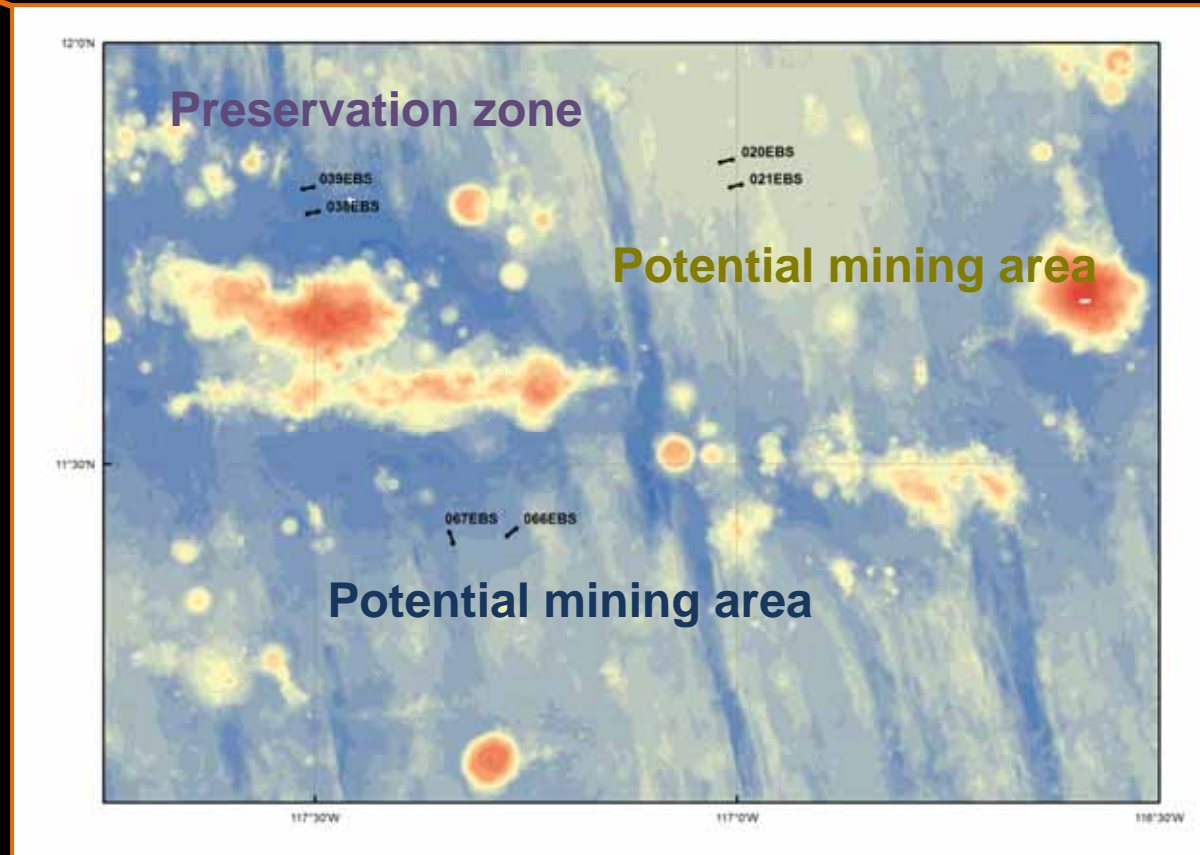
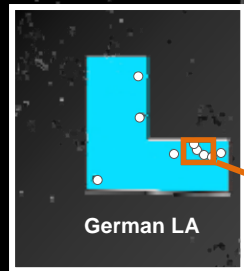


Abundance patterns

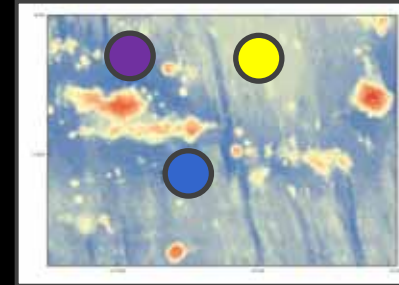
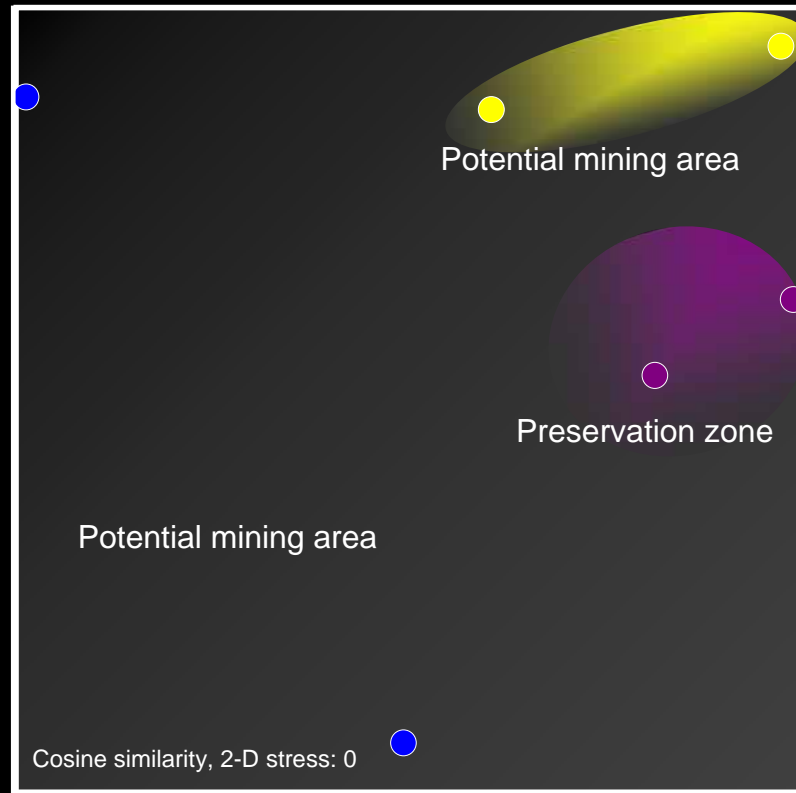
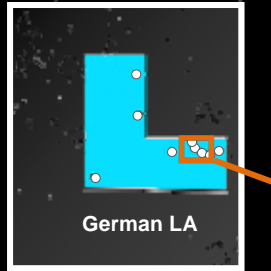
High proportion of unique and duplicate species
Abundant species more widely distributed



Defining preservation zones



Defining preservation zones



74 morpho-species

>70% uniques & duplicates
4% shared



Summary & conclusions



Isopods as a model group

Constraints:

- Sampling effort
- Intercalibration of data sets

Future work



Thanks

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