

**Ministry of Nature Resources and Ecology of Russian Federation
(Minprirodi Rossii)**

Federal Agency for mineral resource exploration (Rosnedra)
STATE SCIENTIFIC CENTER OF RUSSIAN FEDERATION
FEDERAL STATE UNITARY GEOLOGICAL ENTERPRISE
“SOUTHERN SCIENTIFIC & PRODUCTION ASSOCIATION
FOR MARINE GEOLOGICAL OPERATIONS”
(SSC FSUGE “ YUZHMOREGEOLOGIA”)

Macrofauna Investigation on Russian Exploration Area of polymetallic nodules

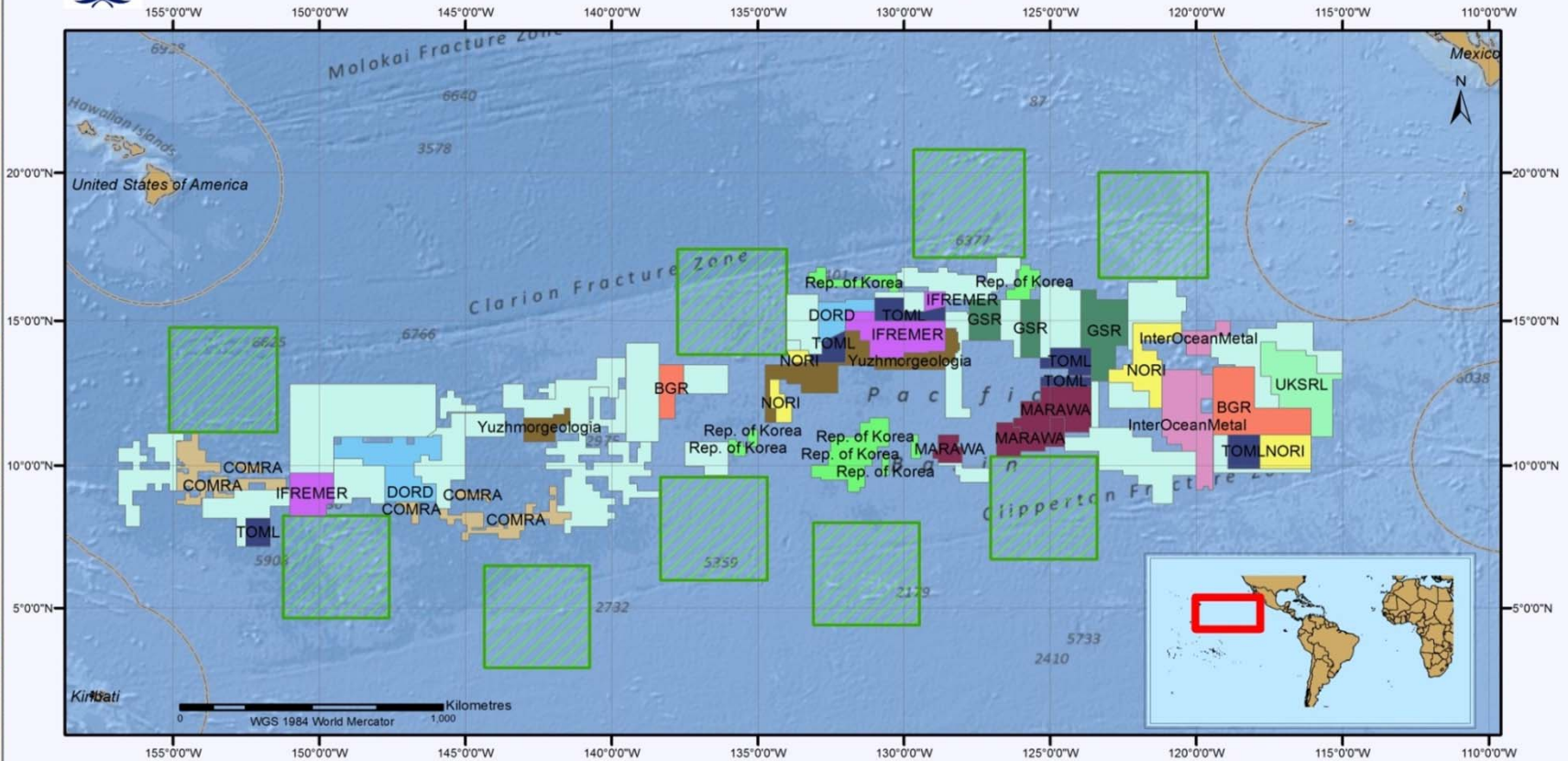
South Korea, Uljin , 2014





Polymetallic Nodules Exploration Areas in the Clarion-Clipperton Fracture Zone

Areas under contract and areas reserved for the International Seabed Authority



Contract area or contract approved as of 28 February 2013

- | | |
|---|---|
| Marawa Research and Exploration Ltd (Kiribati) | Institut français de recherche pour l'exploitation de la mer (IFREMER; France) |
| Bundesanstalt für Geowissenschaften und Rohstoffe (BGR; Germany) | Interoceanmetal (IOM; Bulgaria, Cuba, Czech Republic, Poland, Russian Fed., Slovakia) |
| China Ocean Mineral Resources Research and Development Association (COMRA; China) | Nauru Ocean Resources Inc. (NORI; Nauru) |
| Deep Ocean Resources Development Company (DORD; Japan) | Tonga Offshore Mining Ltd (TOML, Tonga) |
| G-TEC Minerals Resources NV (GSR; Belgium) | UK Seabed Resources Ltd (UKSRL, UK) |
| Government of the Republic of Korea | Yuzhmorgeologia (Russian Federation) |

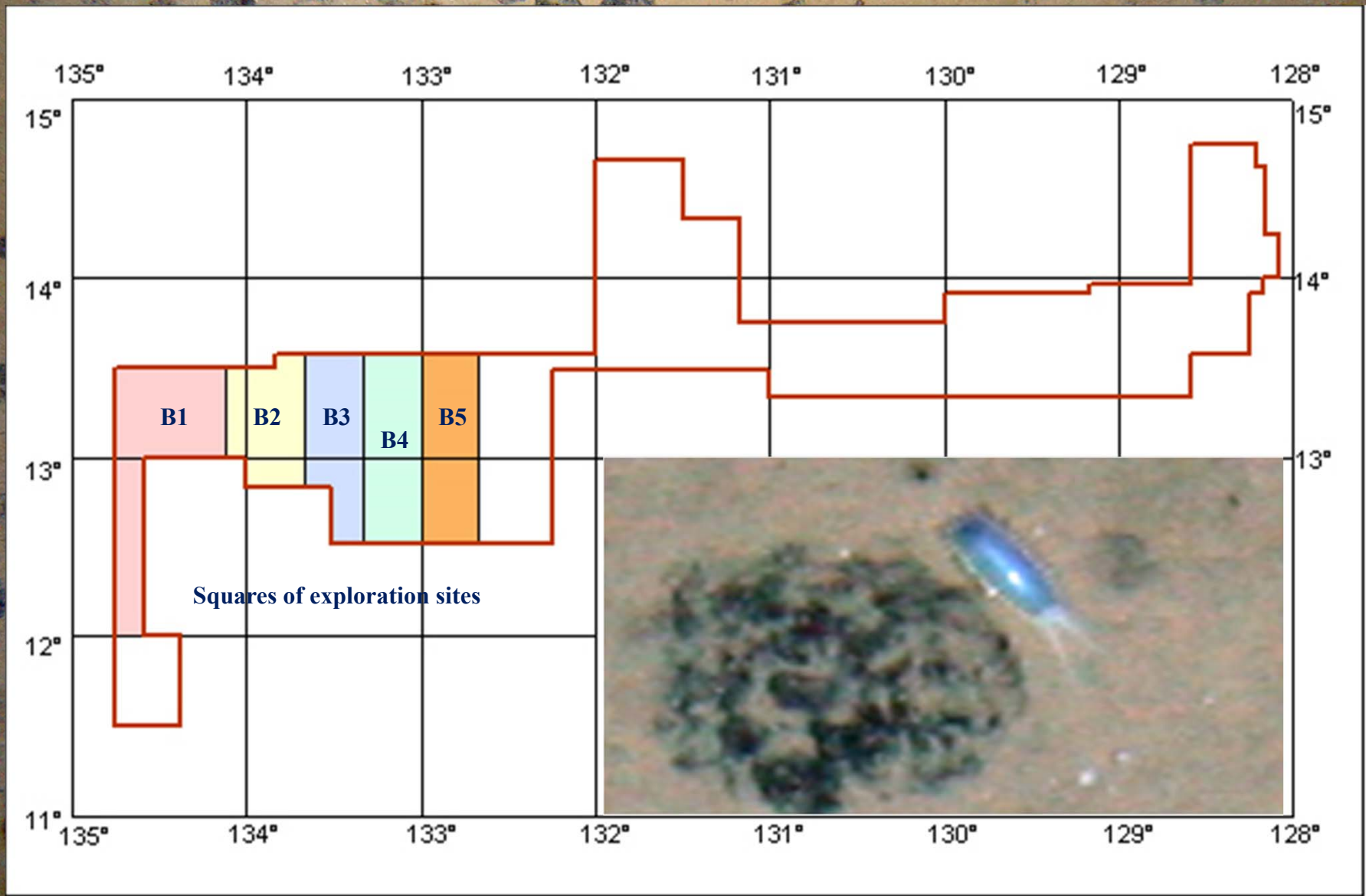
- Reserved area*
 Area of particular environmental interest (APEI)**
 Exclusive Economic Zones (VLIZ, 2011)

* In the case of polymetallic nodules, the so-called parallel system provides that each application for exploration by a developed State must cover two parts of "equal estimated commercial value". One part is allocated to the applicant and the other is to become the reserved area, which is set aside for the conduct of activities by the Authority or developing States.

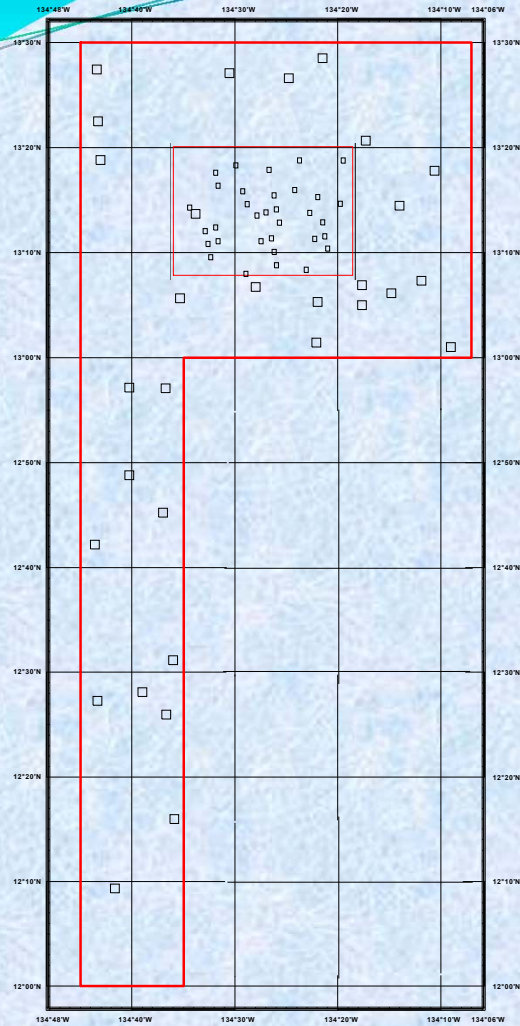
** In July 2012, the Authority adopted an environmental management plan for the Clarion-Clipperton Zone to be implemented on a provisional basis over an initial three-year period. The plan includes the designation of a network of areas of particular environmental interest (ISBA/18/C/22).



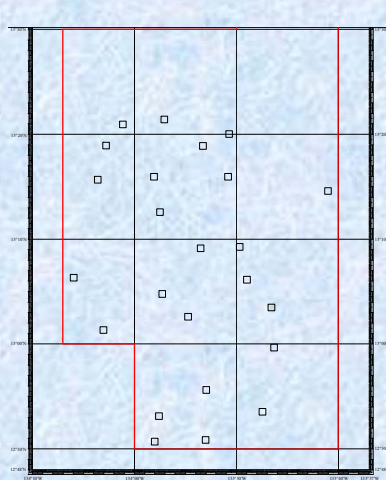
Eastern Polygon Layout of Russian exploration area



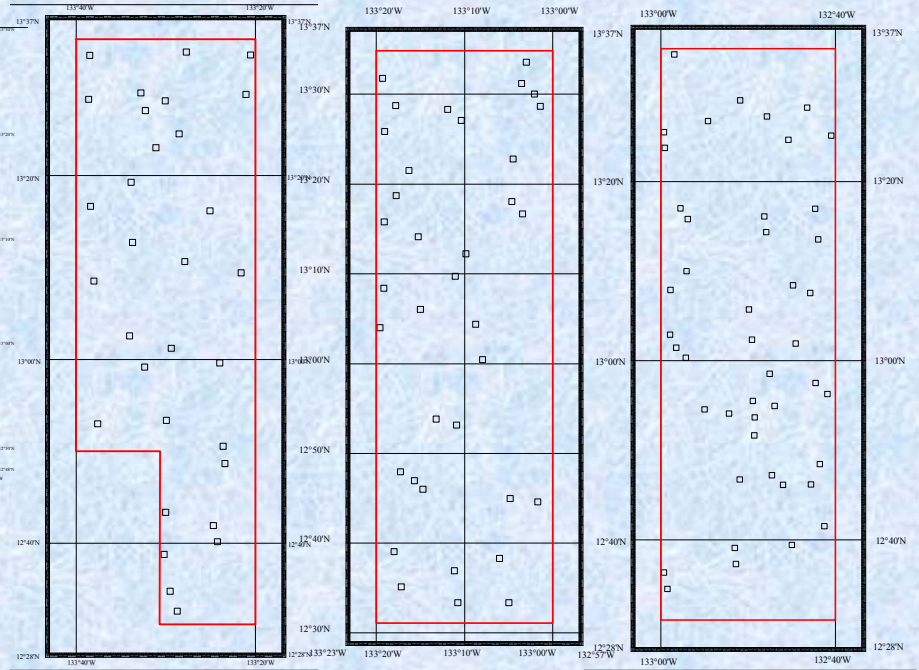
Macrofauna station location on explored sites



2006
2007



2008



2009

2011

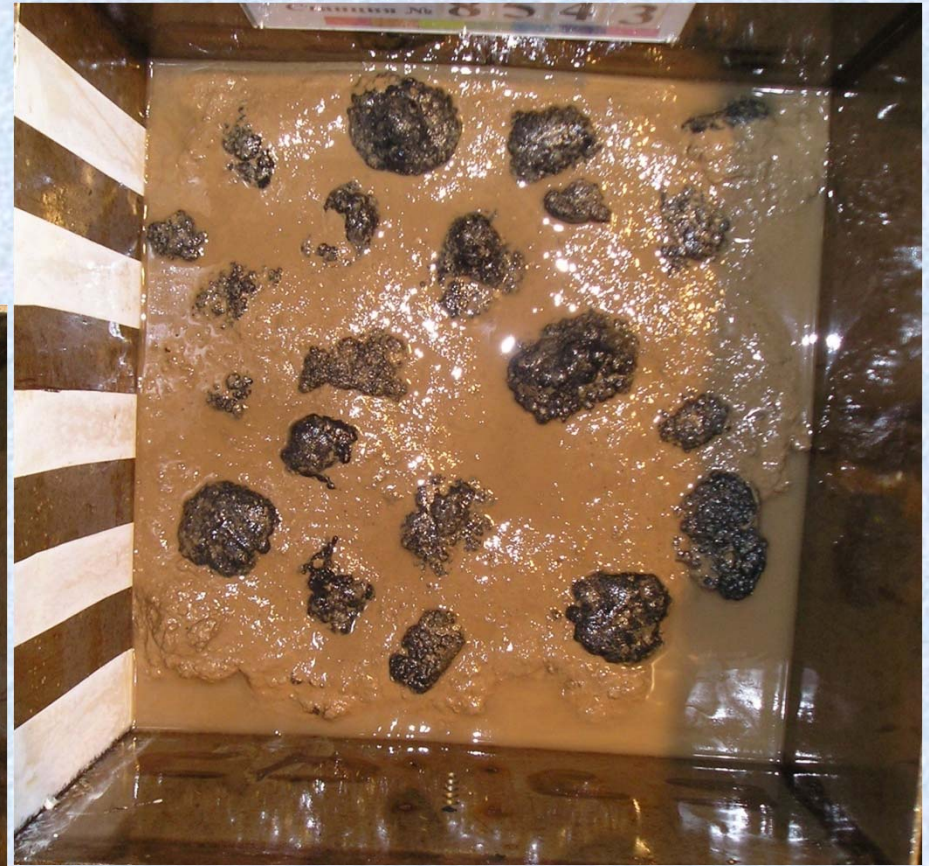
2013



Total number of macrofauna samples - 196

Content one macrofauna sample:

1. Sediment wash from manganese nodule
2. Sediment layer 0 – 2 cm
3. Sediment layer 2 – 5 cm
4. Sediment layer 5 – 10 cm
5. Animals and biogenic structures from manganese nodule

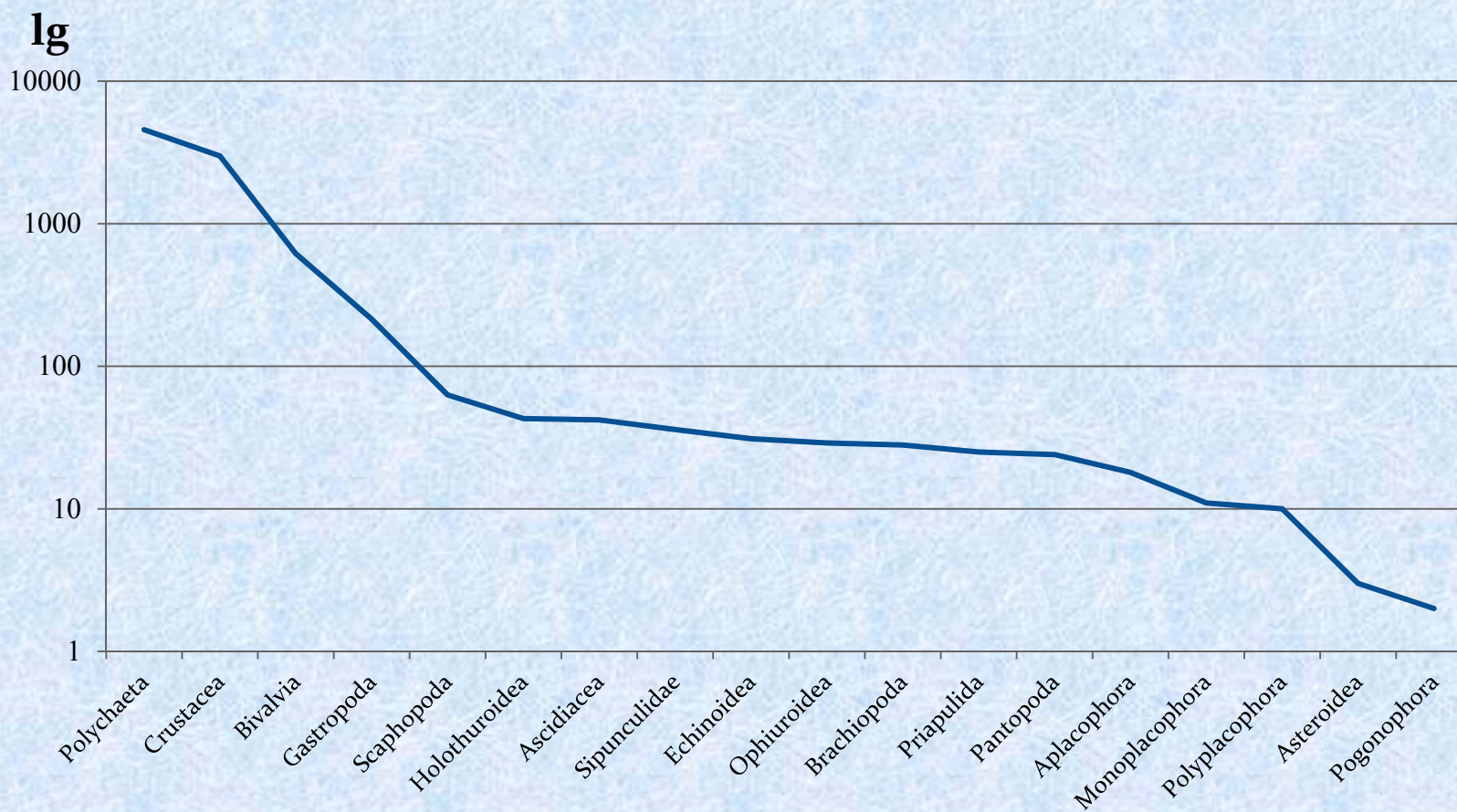


Total number of macrofauna specimens stored in collection
(196 samples)

	<i>Taxon</i>	<i>number</i>	<i>%</i>
1	Polychaeta	4574	52,22
2	Crustacea	2991	34,13
3	Bivalvia	616	7,03
4	Gastropoda	214	2,44
5	Scaphopoda	63	0,72
6	Holothuroidea	43	0,49
7	Ascidiacea	42	0,48
8	Sipunculidae	36	0,41
9	Echinoidea	31	0,35
10	Ophiuroidea	29	0,33
11	Brachiopoda	28	0,32
12	Priapulida	25	0,28
13	Pantopoda	24	0,27
14	Aplacophora	18	0,21
15	Monoplacophora	11	0,13
16	Polyplacophora	10	0,12
17	Asteroidea	3	0,04
18	Pogonophora	2	0,03
	Total	8760	



Distribution of macrofauna taxons in collection (lg number)



Total number of macrofauna specimens stored in collection (196 samples)
with crustaceans divided on orders

	<i>Taxon</i>	<i>Number</i>	<i>%</i>
1	Polychaeta	4574	52,22
2	Tanaidacea	1423	16,24
3	Isopoda	1391	15,88
4	Bivalvia	616	7,03
5	Gastropoda	214	2,44
6	Amphipoda	136	1,55
7	Scaphopoda	63	0,72
8	Holothuroidea	43	0,49
9	Ascidiacea	42	0,48
10	Sipunculidae	36	0,41
11	Echinoidea	31	0,35
12	Ophiuroidea	29	0,33
13	Brachiopoda	28	0,32
14	Priapulida	25	0,28
15	Pantopoda	24	0,27
16	Decapoda	22	0,25
17	Aplacophora	18	0,21
18	Thermosbaenacea	11	0,13
19	Monoplacophora	11	0,12
20	Polyplacophora	10	0,12
21	Cumacea	8	0,09
22	Asteroidea	3	0,04
23	Pogonophora	2	0,03
	Total	8760	



Total number of meiofauna specimens in macrofauna samples
(196 samples)

	<i>Taxon</i>	<i>Number</i>	<i>%</i>
1	Nematoda	15984	60,9
2	Harpacticoida	8775	33,4
3	Ostracoda	1389	5,3
4	Kinorhyncha	34	0,1
5	Halacaridae	14	<0,1
6	Nemertea	12	<0,1
7	Turbellaria	10	<0,1
8	Gastrotricha	7	<0,1
9	Tantulocarida	3	<0,1
10	Tardigrada	2	<0,1
	Total	26230	



POLYCHAETA

4574 specimens

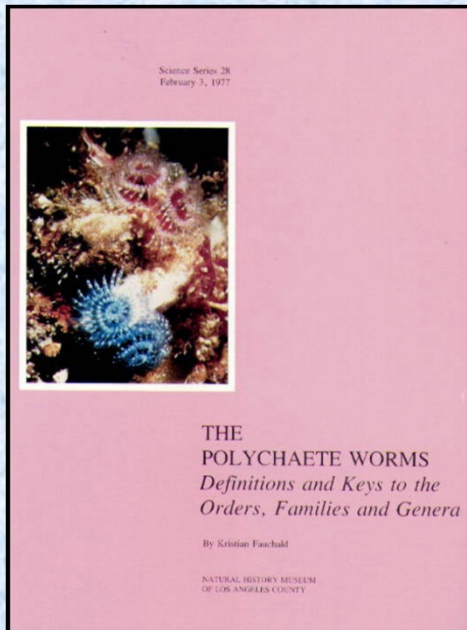
Polychaeta is very diverse and fragile taxon. Most part of the specimens are found in sample destroyed despite on careful treatment.



Some Polychaeta specimens are stable and have enough features to be identified to family or genus level.

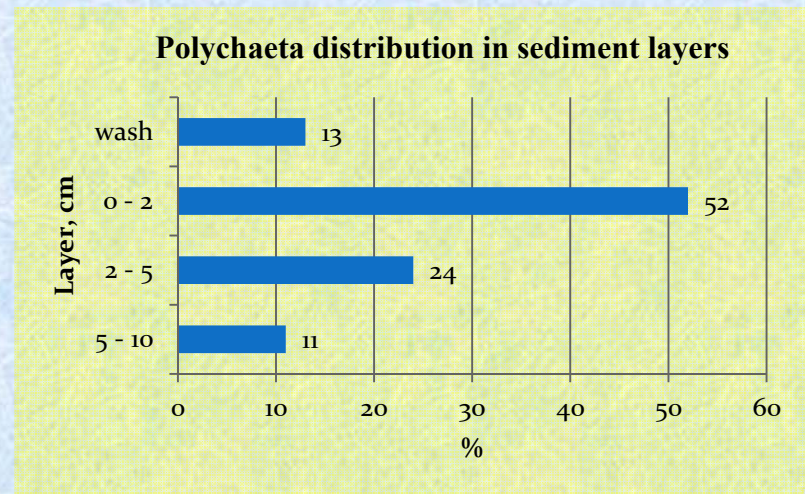


Phyllodoceidae



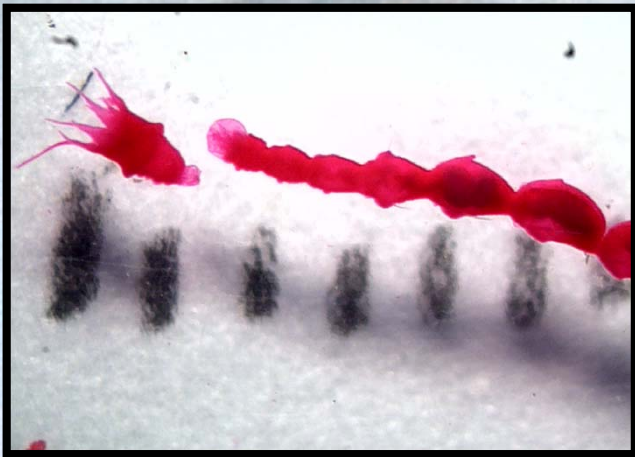
Polychaeta key book of K. Fauchald (1977) is more accepted in the science literature for Polychaeta identification.

Available in WEB



POLYCHAETA

Many Polychaeta species belong to nodule epifauna and live in sediment or calcareous tubes attached to nodule surface

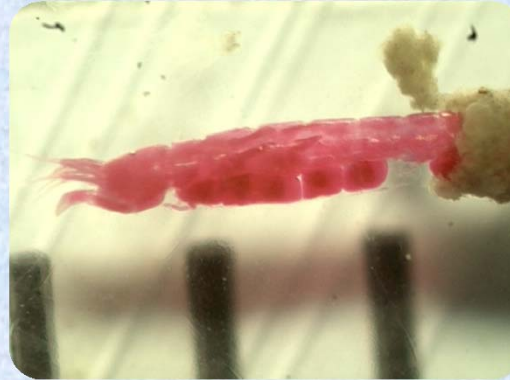
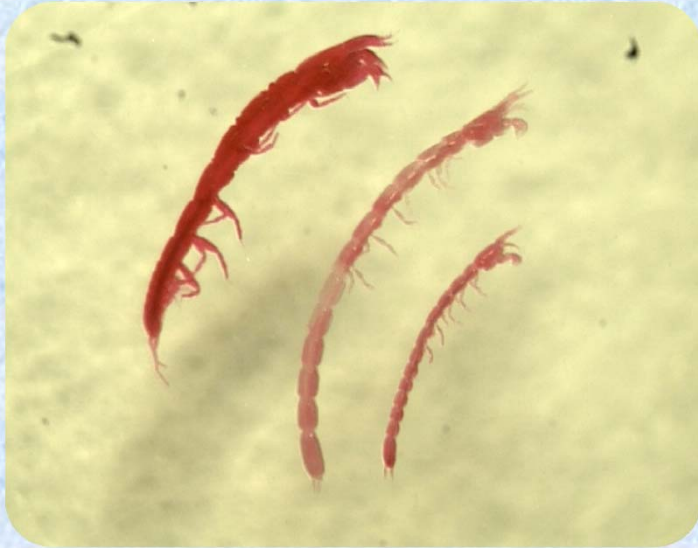


TANAIDACEA

1423 specimens

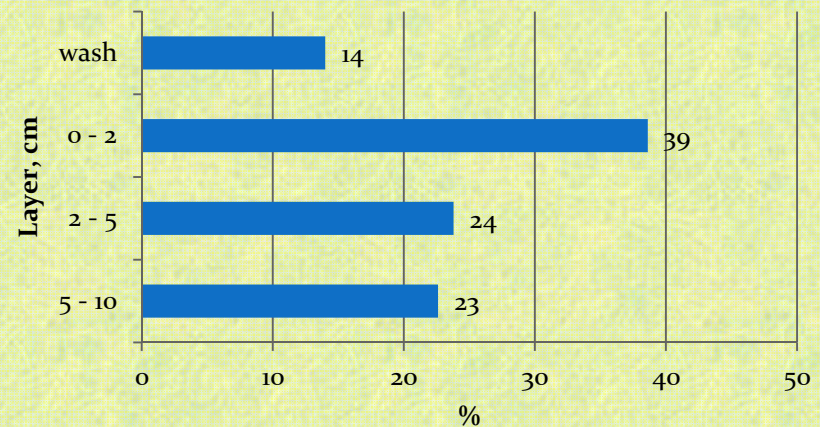
Tanaidacea is very diverse taxon. Most part of the specimens are stable enough to be identified .

Some tanaids live in small tubes where they grow their eggs and larvae



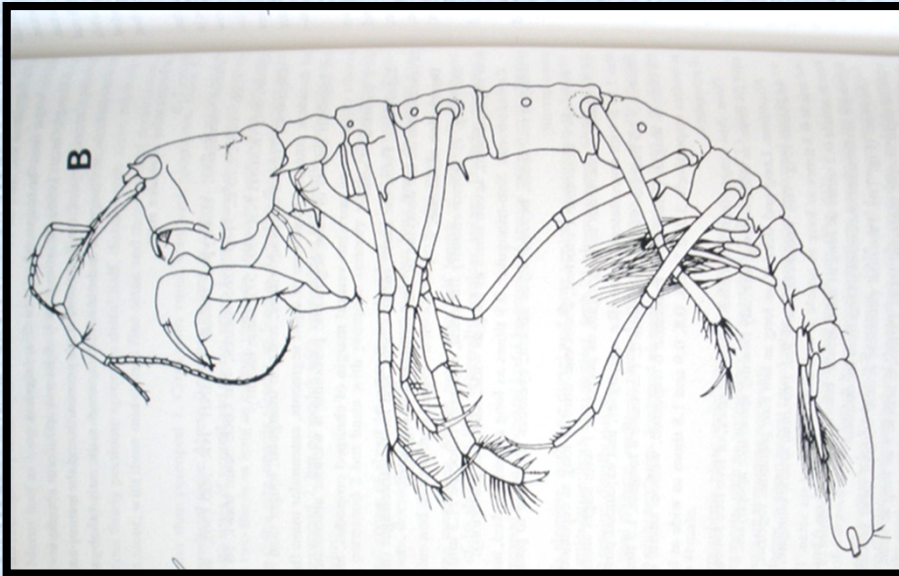
The authors of well known key-books for some of deep-sea Tanaids are
Kim Larsen,
Kudinova-Pasternak R.,
Bird GJ,
Sieg J,
Bamber RN
and others
Some available in WEB

Tanaidacea distribution in sediment layers



TANAIDACEA

Some large tanaidacea can be well identified by drawings



lateral view

microscope photo

Carpoapseudes



ISOPODA

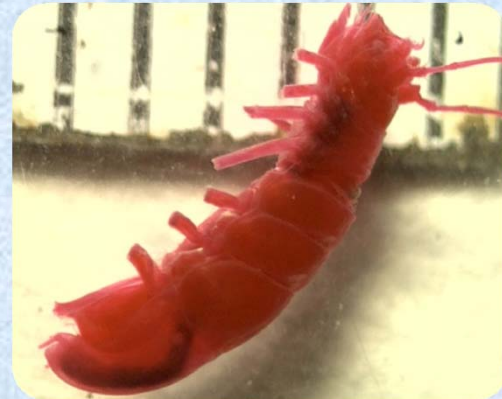
1391 specimens

Isopoda is very diverse taxon. Most part of the specimens have a good condition in sediment samples.



Dendrotion

Fragile and unstable isopod species belong to Munnopsidae family. Almost all munnopsids have been found in samples without legs and antennas.

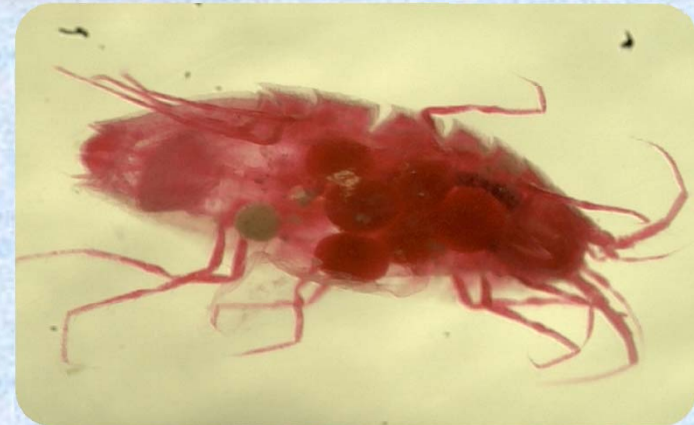


Munnopsidae



Isopod key books of O. Kusakina (1979-2003), K. Barnard, T. Wolff are well known in the science literature for isopod identification.

Available in WEB



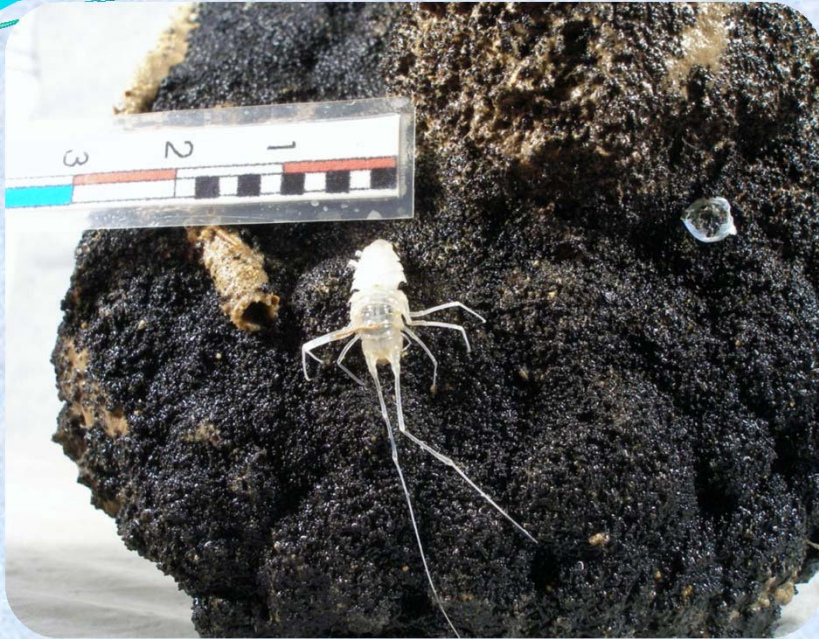
Isopod females can be found with eggs, it is possible to determine a species productivity

Haploniscus



ISOPODA

Isopoda on beneath of nodule

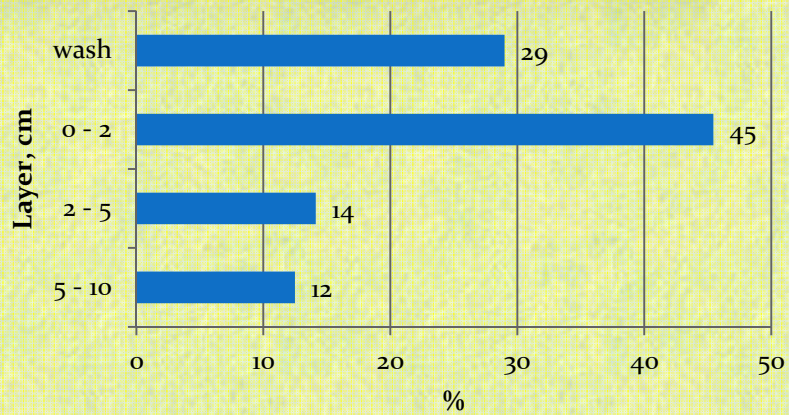


Rectisura, Munnopsidae

Isopoda in polychaeta tube



Isopoda distribution in sediment layers



Desmosomatidae

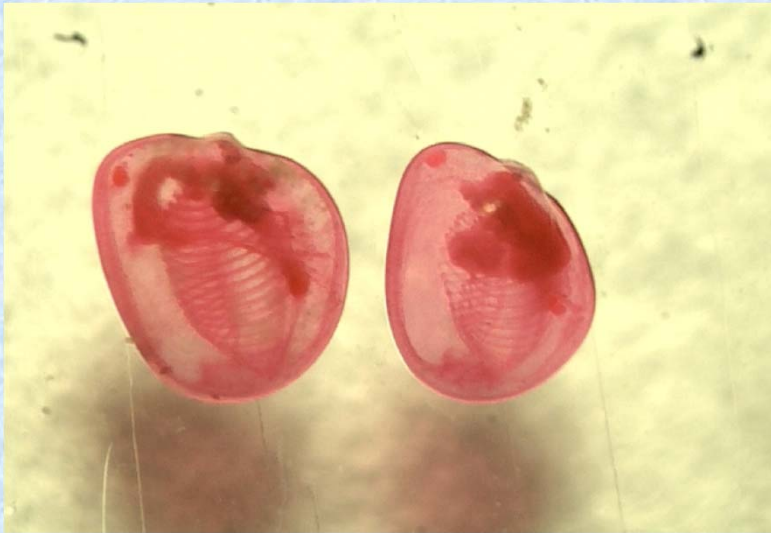


BIVALVIA

616 specimens

Most of bivalves are very small and fragile

Only few specimens can reach size 1 cm or more



Dacrydium



Cuspidaria

There are too few books about abyssal bivalvia.

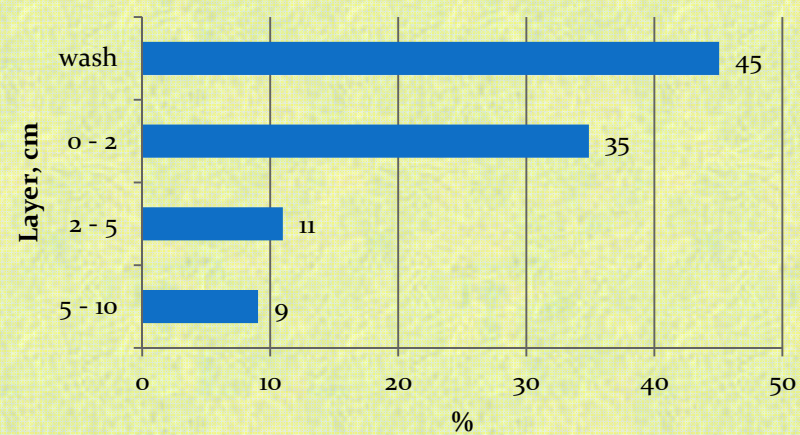
The more **available** key book:

The systematics and biology of abyssal and hadal Bivalvia.

J. Knudsen

Available in WEB

Bivalvia distribution in sediment layers





BIVALVIA

Bivalves from family Arcidae belong to the nodule epifauna



Position *Arca* on the nodule surface



Some of the bivalves can be seen on bottom photos

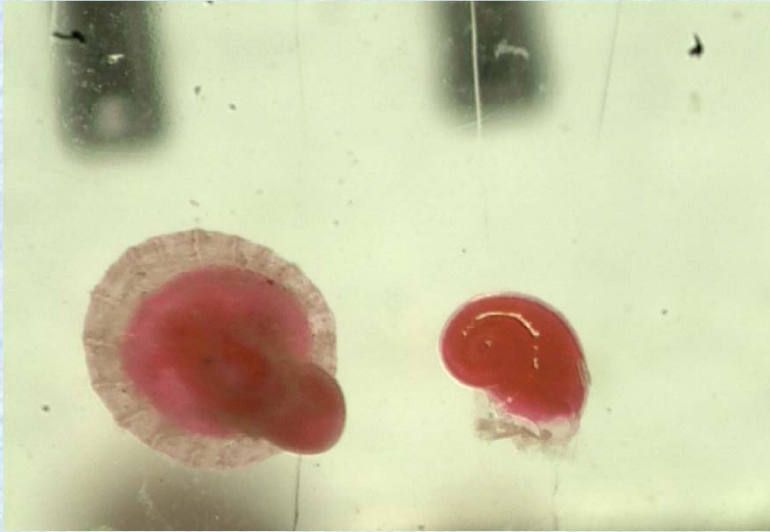
Cyclopecten

GASTROPODA

214 specimens

Most of gastropods are very small and fragile

Only few specimens can reach size 1 cm or more



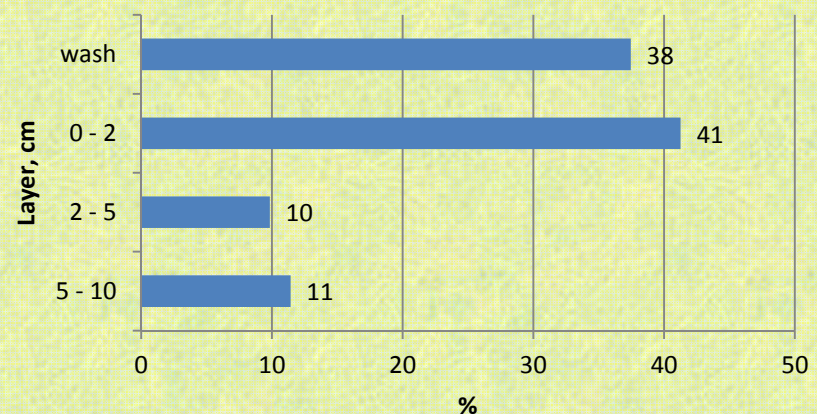
Cuspidaria

There are not special key books for abyssal gastropods.

Some deep-sea species described Rex M.A., Hickman C.S., Clarke A.H. and others

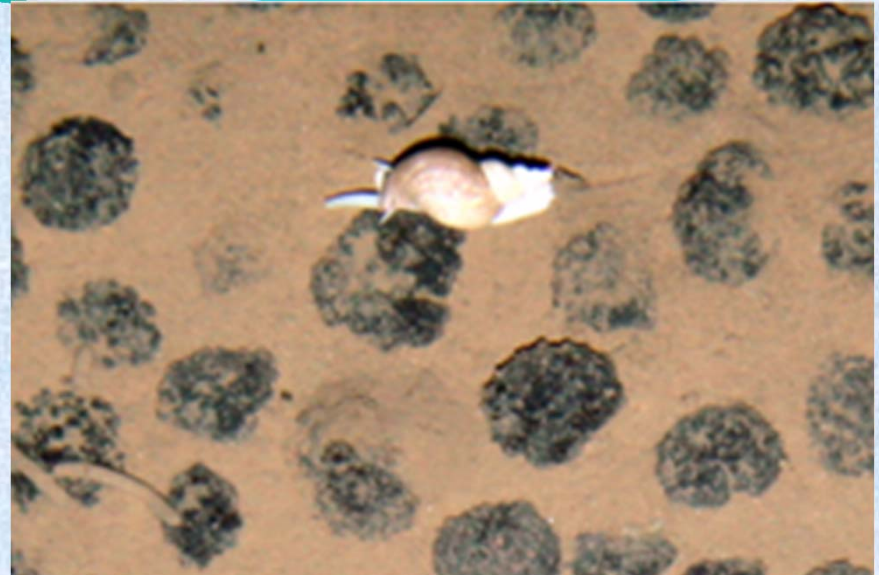
Some available in WEB

Gastropoda distribution in sediment layers

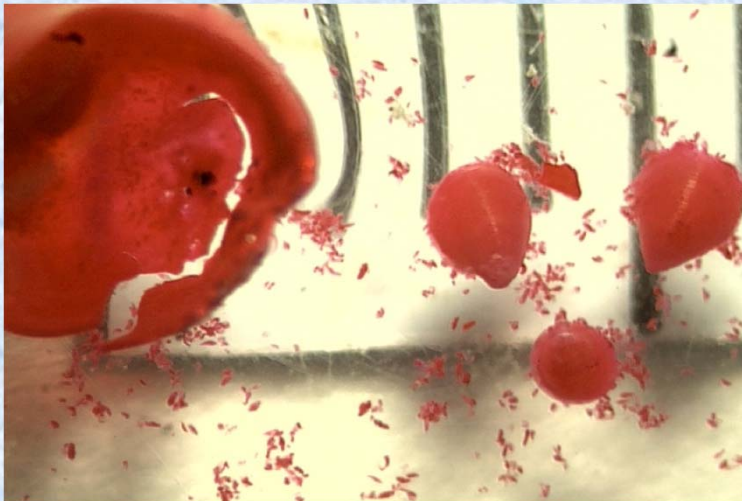


GASTROPODA

Small gastropods live inside the empty turbellaria cocoons



Some Gastropods can be seen on bottom photos



Total number of nodule epifuna specimens stored in collection
(218 samples)

	<i>Taxon</i>	<i>number</i>	<i>%</i>
1	Bryozoa	278	23,2
2	Stephanoscyphus	278	23,2
3	Polychaeta	230	19,2
4	Xenophyophorida	128	10,7
5	Porifera	125	10,4
6	Turbellaria cocoon	40	3,3
7	Brachiopoda	28	2,3
8	Ascidacea	24	2,0
9	Actiniaria	22	1,8
10	Anthozoa	15	1,3
11	Bivalvia	8	0,7
12	Hydrozoa	8	0,7
13	Cirripedia	6	0,5
14	Crinoidea	5	0,4
15	Entoprocta	2	0,2
16	Priapulida	1	0,1
	Total	1198	



Questions to the workshop

1. What is the level of taxonomic identification for each taxon (order, family, genus, species)?
2. Is it necessary to use the special key books developed for CCFZ or regular key books and taxonomic papers are enough?
3. What is the possibility to create special key books for CCFZ?
4. Nodule epifauna is a special diverse community which will be expose during mining. Is it necessarily to organize a special workshop for epifauna or consider that group together with macrofauna?
5. What we should do with meifauna taxons (having sizes more than 0.25 mm) found in macrofauna samples?
6. What is the taxonomic system for macrofauna we need to use?





THANK YOU FOR ATTENTION

