



MUSÉUM NATIONAL
D'HISTOIRE NATURELLE

Etmopterus viator sp. nov. - a new
species of lantern shark from the
Southern Hemisphere

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Introduction - Etmopteridae

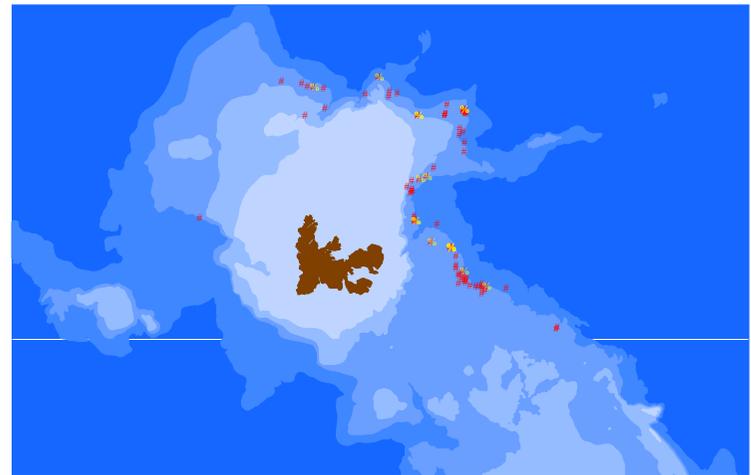
- most speciose family of Squaliformes (dogfish sharks)
- inhabitants of bathyal environment (200 – 2500 m)
- highly endemic vs wide distribution ranges
- size range: 20cm – 110cm
- slow growth and low reproduction rate
- many species are by-catch of commercial deep-sea fisheries
- bioluminescent organs

Introduction – the Kerguelen Lantern Shark

- reaches 60 cm
- preliminary identified as *Etmopterus cf. granulosus* (Duhamel et al. 2005)
- taxonomic assignment is difficult



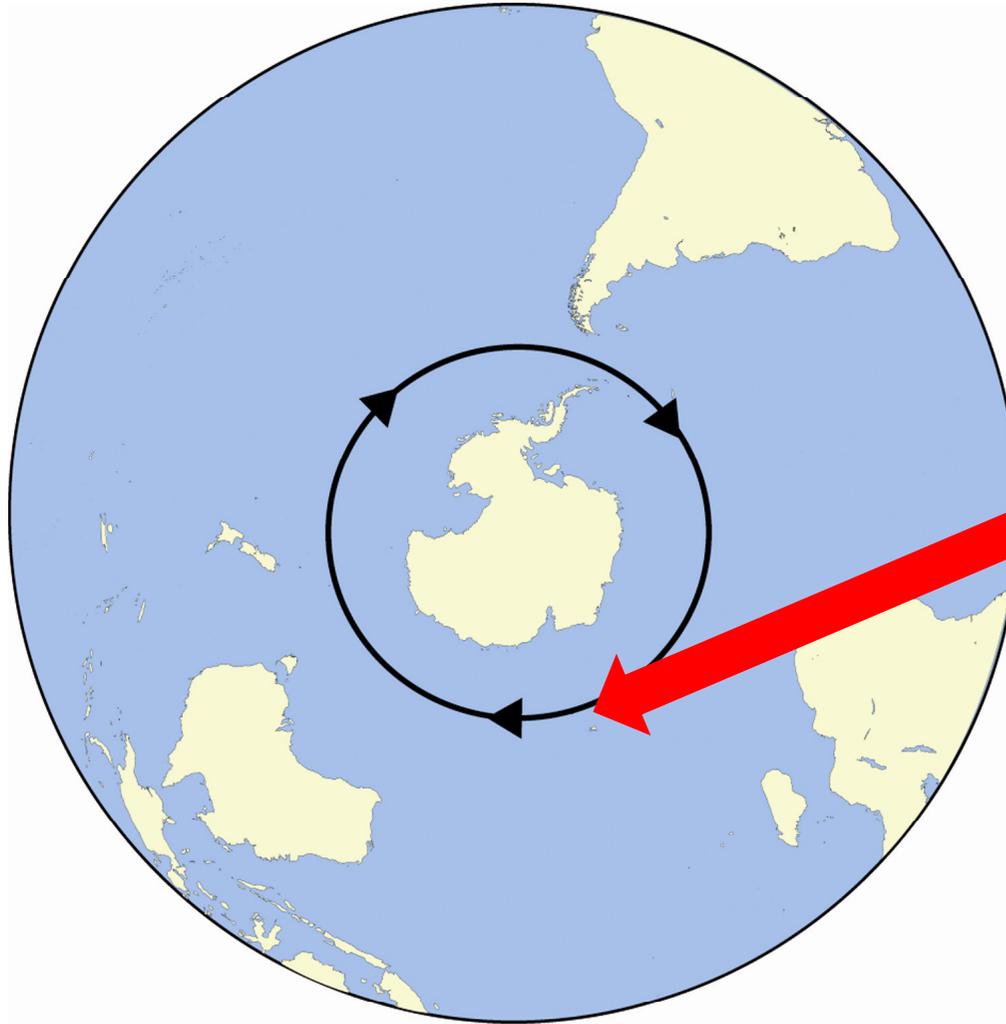
Etmopterus cf. granulosus



From: Duhamel et al. (2005)

➔ member of a morphologically uniform group with unresolved taxonomy

Introduction – the Kerguelen Lantern Shark



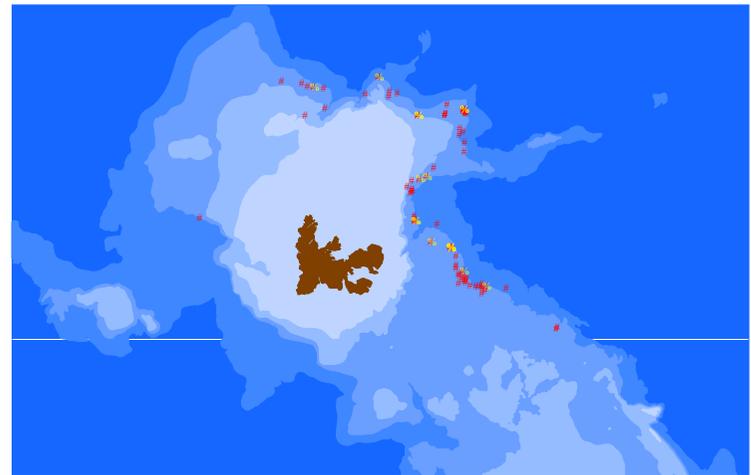
Kerguelen Plateau:
Southern Indian Ocean,
lies within CAC,
French territorial waters

Introduction – the Kerguelen Lantern Shark

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Etmopterus cf. granulosus



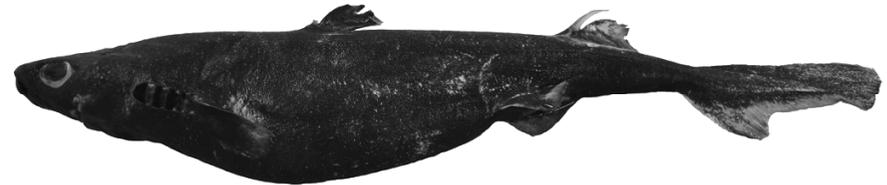
From: Duhamel et al. (2005)

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Introduction – congeners



Etmopterus granulosus (Chile)



Etmopterus baxteri (New Zealand)



Etmopterus unicolor (Japan)



Etmopterus unicolor „sp. B“ (New Caledonia)



Etmopterus litvinovi (Sala-y-Gomez Ridge, Chile)



Etmopterus princeps (North Atlantic)

Introduction

Molecular Phylogeny

AFLPs

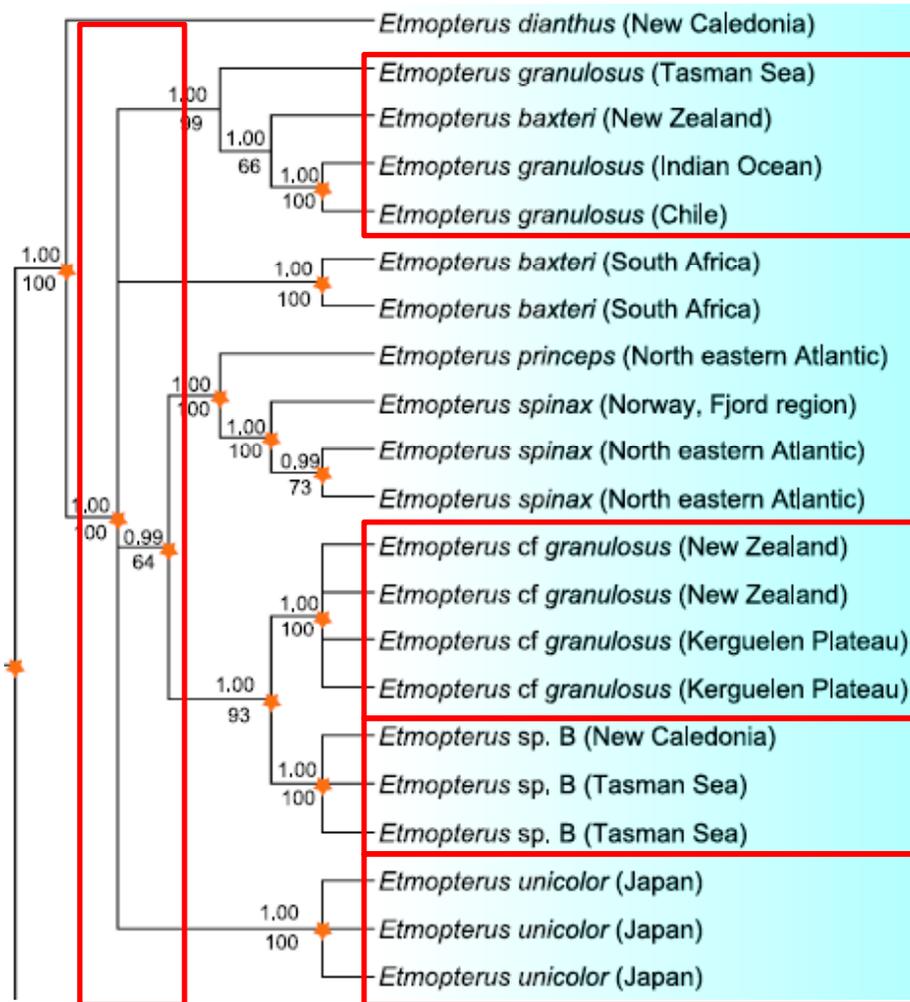
Identification

Summary

Discussion

Perspectives

Molecular Phylogeny – *Etmopterus spinax* clade



sequences data:

- portion of RAG1 (nuclear, 1454 bp)
- COI (mtDNA, 655 bp)
- 12S- partial 16S, tRNAVal and tRNAPhe (mtDNA, 2606 bp)

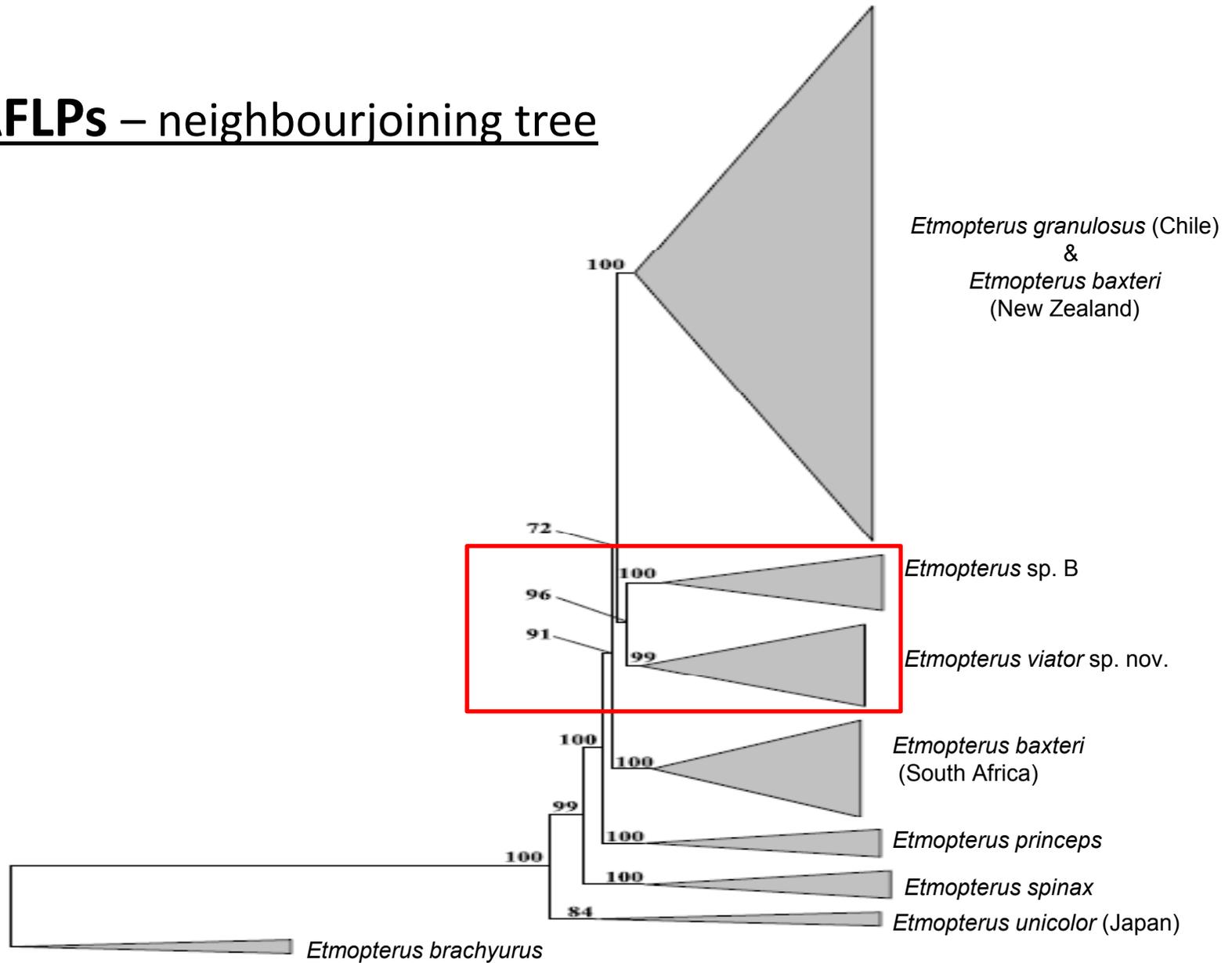
Molecular Phylogeny – implications

- ➔ *E. sp B* is not synonym to *E. unicolor*
- ➔ the Kerguelen Lantern Shark (*E. cf. granulosis*) forms a distinct clade. Cryptic species?
- ➔ further phylogenetic analyses based on more samples

AFLPs – Amplified Fragment Length Polymorphisms

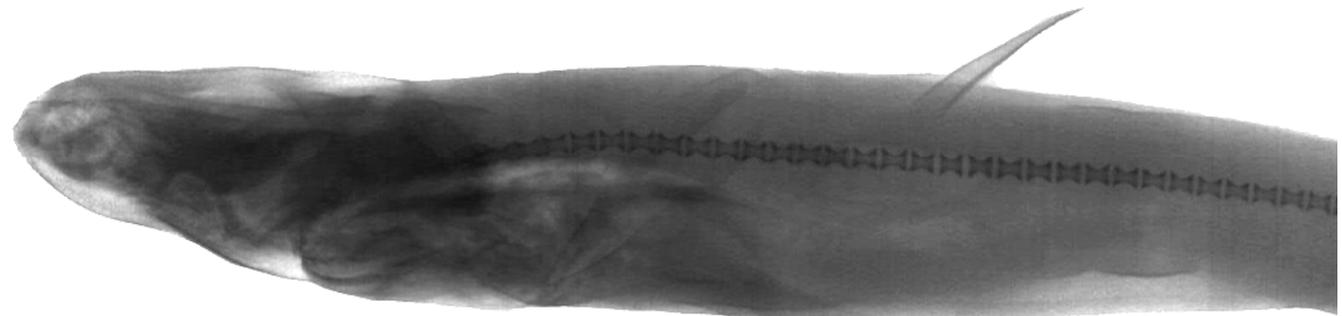
- population genetic approach
- informative on inter- and intraspecific level
- matrix comprising 2655 loci
- re-evaluating phylogeny of the *E. spinax* clade

AFLPs – neighbourjoining tree



Identification of *Etmopterus* species

- morphology of dermal denticles (skin)
- morphometrics (body measurements)
- shape of flank markings
- meristics e.g. number of vertebrae, number of spiral valve turns
- sequencing of the „barcoding“ gene COI



ID of *Etmopterus viator* sp. nov. – dermal denticles

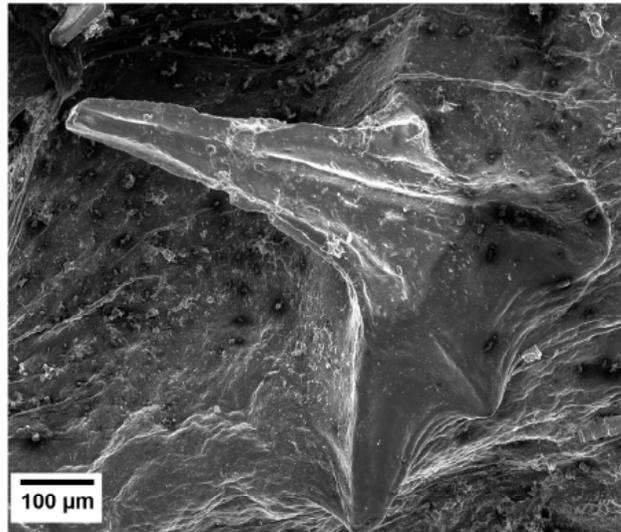
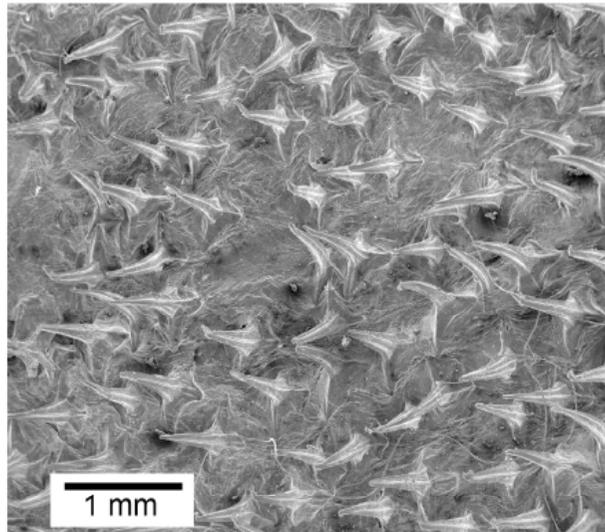


E. viator sp.nov.

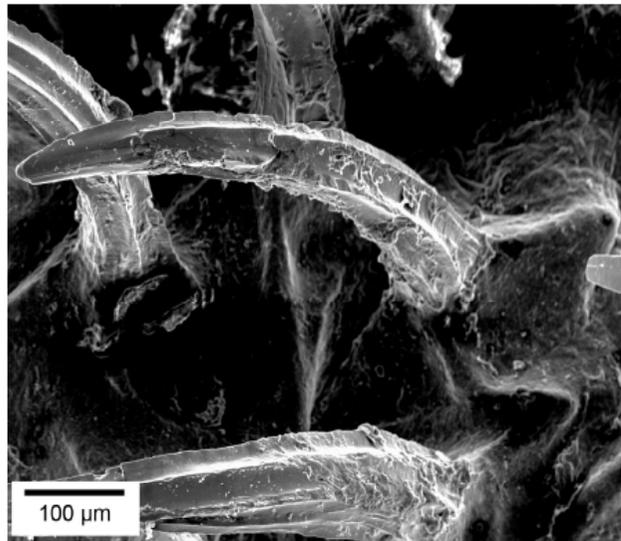
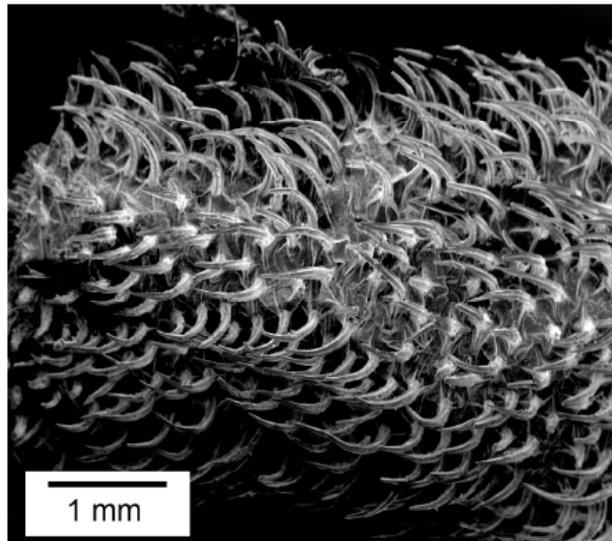


E. sp. B

ID of *Etmopterus viator* sp. nov. – dermal denticles



E. viator sp.nov.



E. sp. B

ID of *Etmopterus viator* sp. nov. – dermal denticles

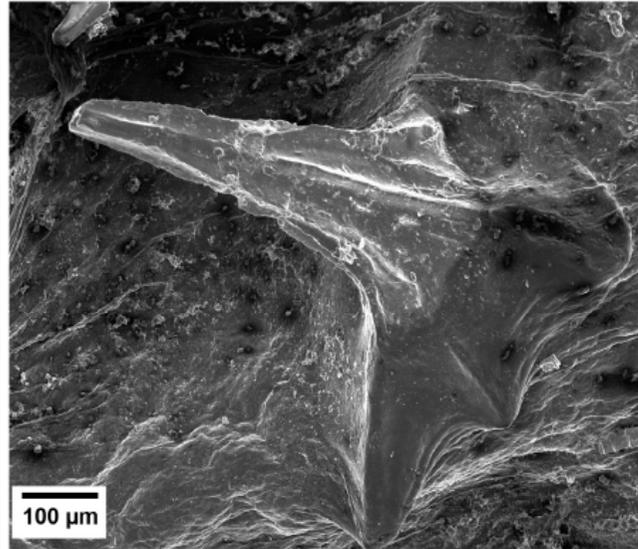
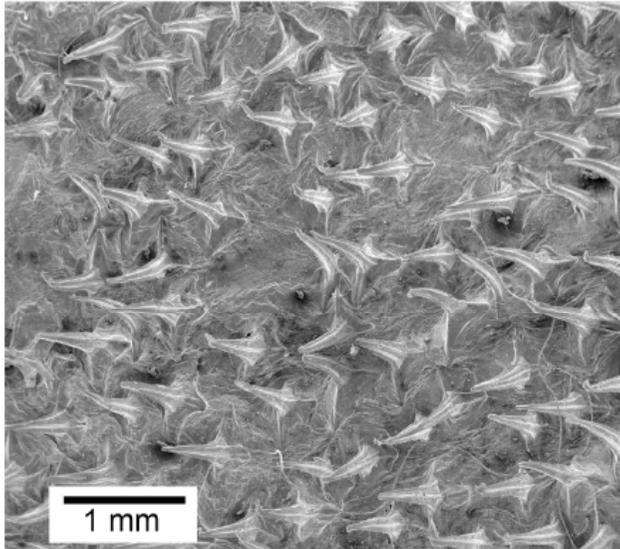


E. viator sp.nov.

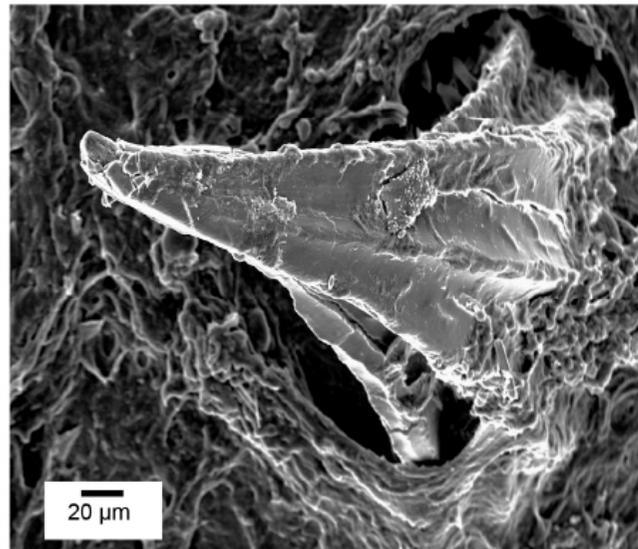
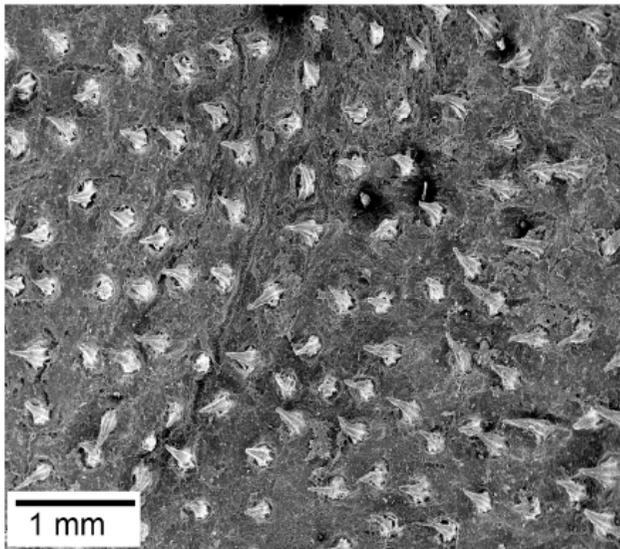


E. granulosus (holotype)

ID of *Etmopterus viator* sp. nov. – dermal denticles

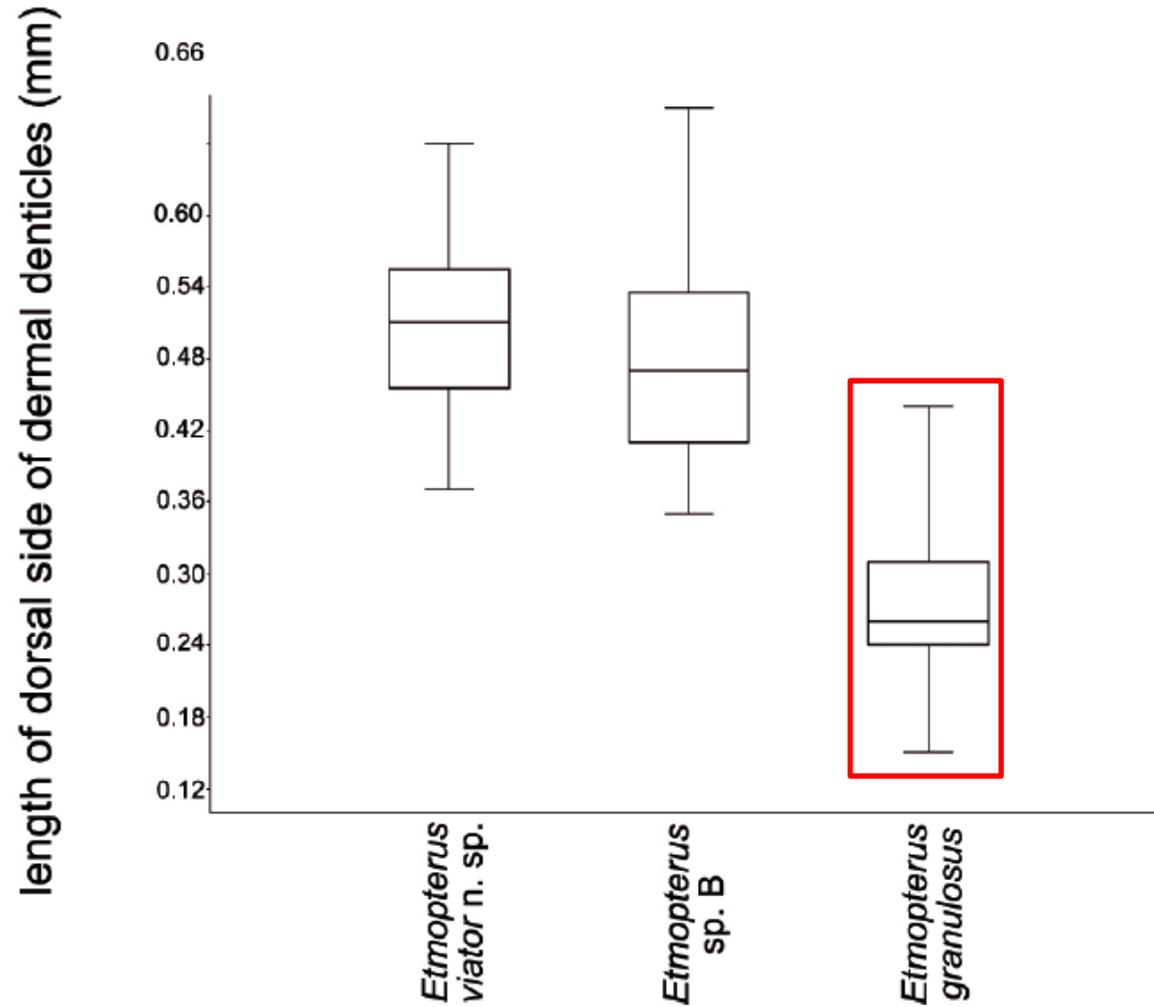


E. viator sp.nov.



E. granulosus

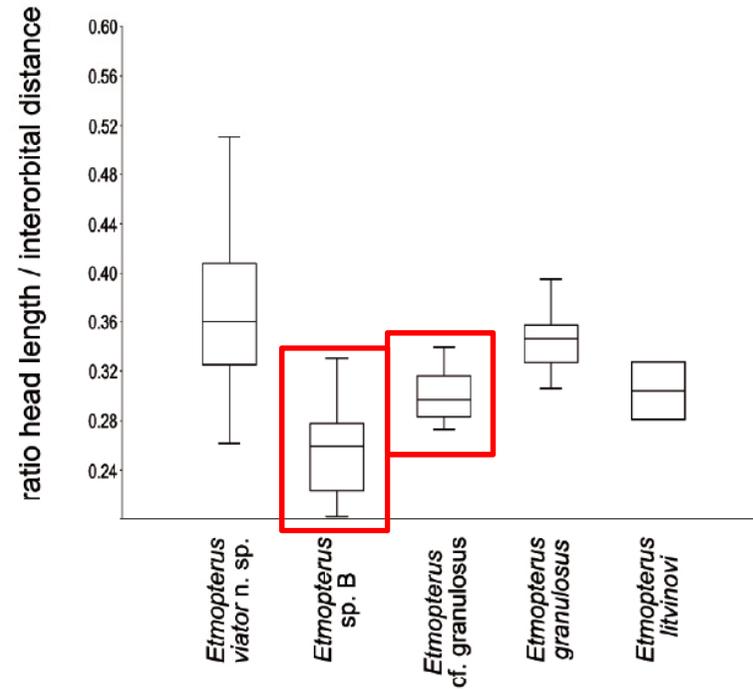
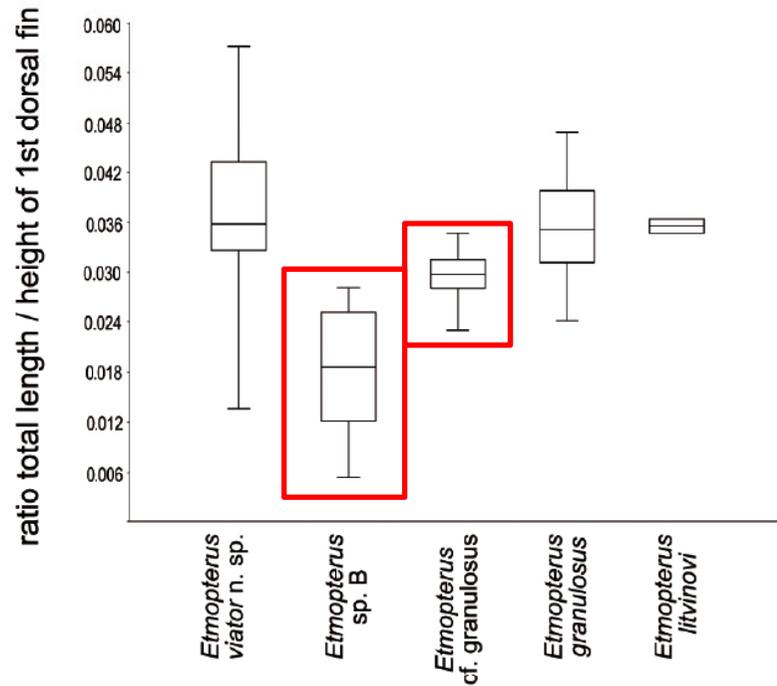
ID of *Etmopterus viator* sp. nov. – dermal denticles



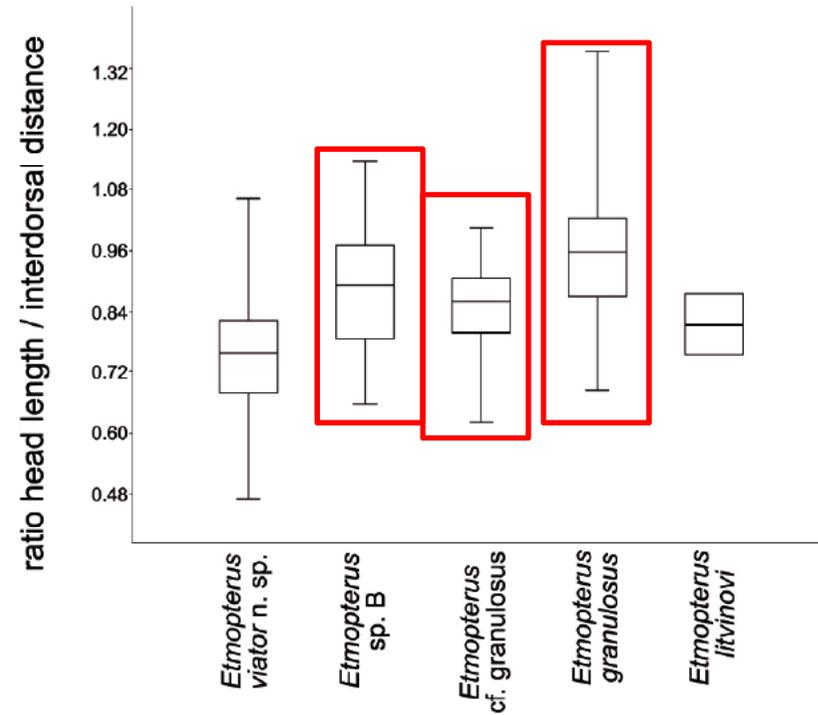
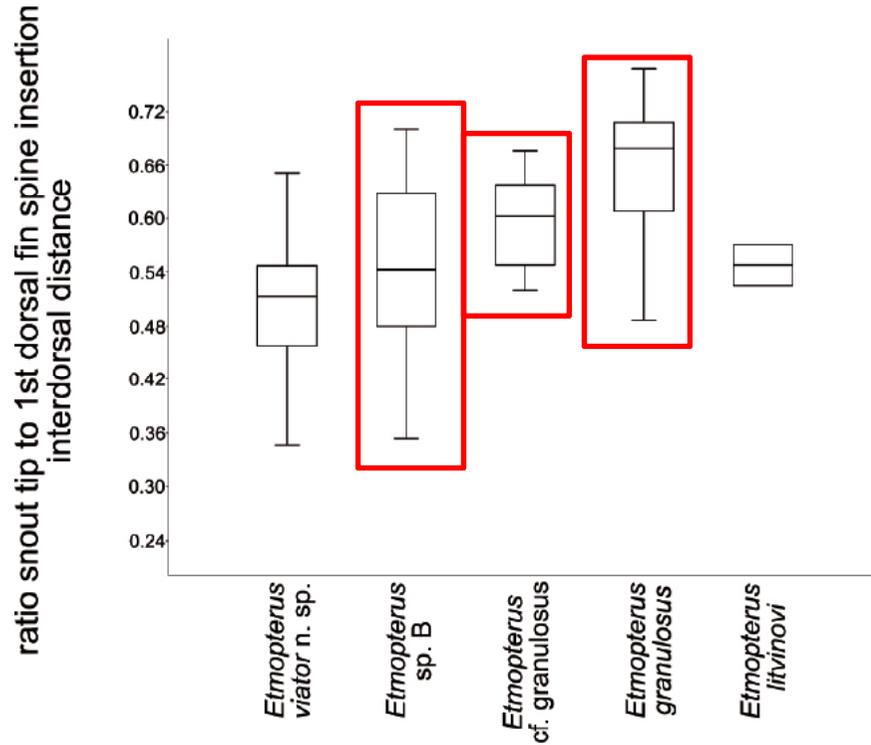
ID of *Etmopterus viator* sp. nov. - morphometrics

- 31 body measurements of 50 specimens of the new species, 27 specimens of *E. granulosus*, 18 specimens of *E. sp. B*, 16 specimens of *E. cf. baxteri*
- four ratios (discussed as species specific) computed:
 1. head length vs. interdorsal distance (HL/ID)
 2. distance snout tip to first dorsal fin spine insertion vs. the interdorsal distance (PFDL/ ID)
 3. head length vs. the interorbital distance (HL/ IOD)
 4. total length vs. the height of the first dorsal fin (TL/HFDF)
- Multi factorial ANOVA

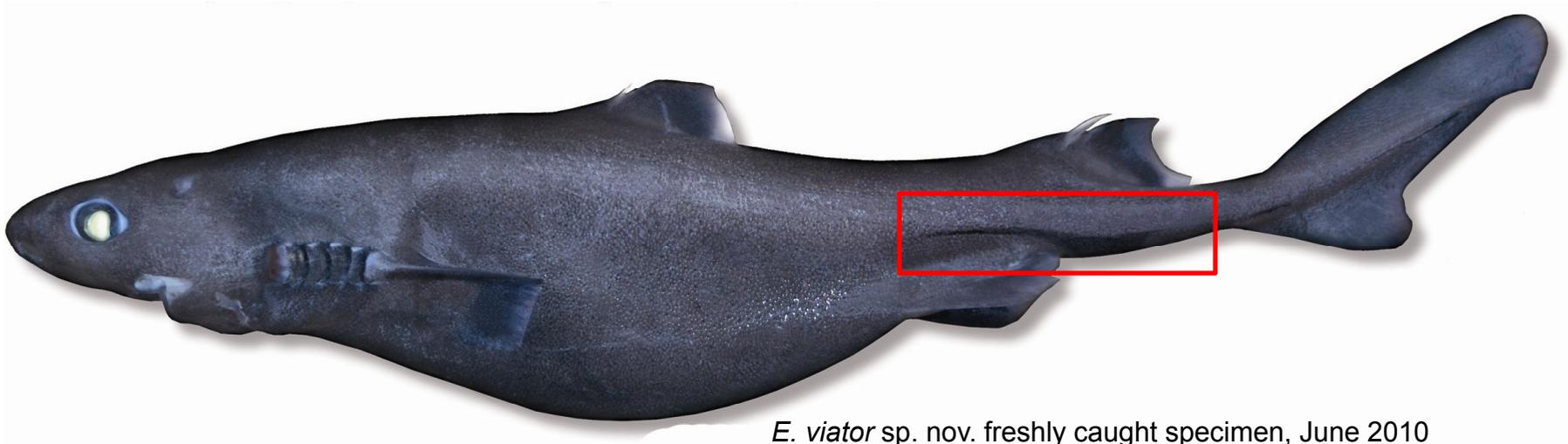
ID of *Etmopterus viator* sp. nov. - morphometrics



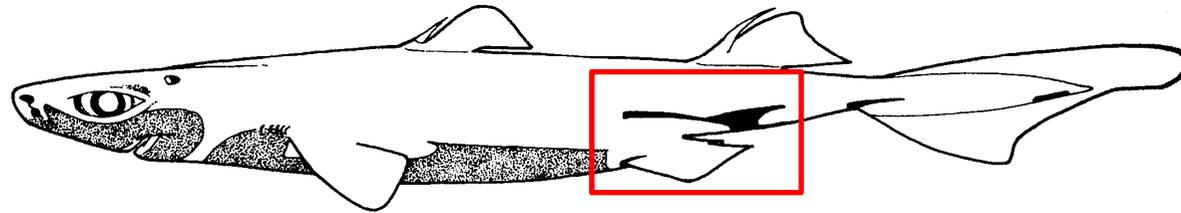
ID of *Etmopterus viator* sp. nov. - morphometrics



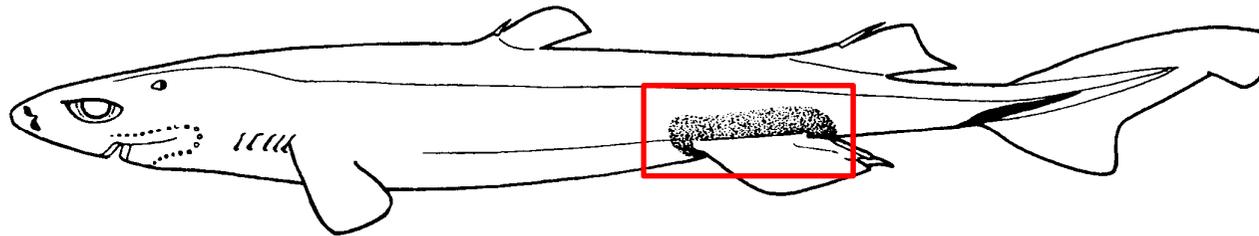
ID of *Etmopterus viator* sp. nov. – flank markings



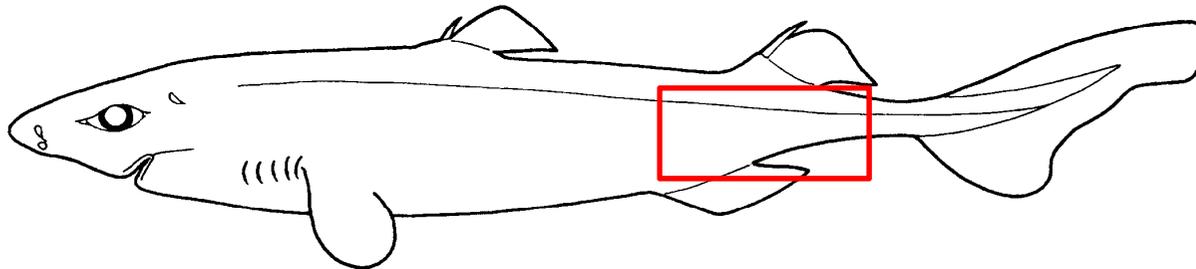
ID of *Etmopterus viator* sp. nov. – flank markings



E. viator sp. nov./ *E. granulosus* /
Etmopterus cf. *granulosus*
(South Africa)



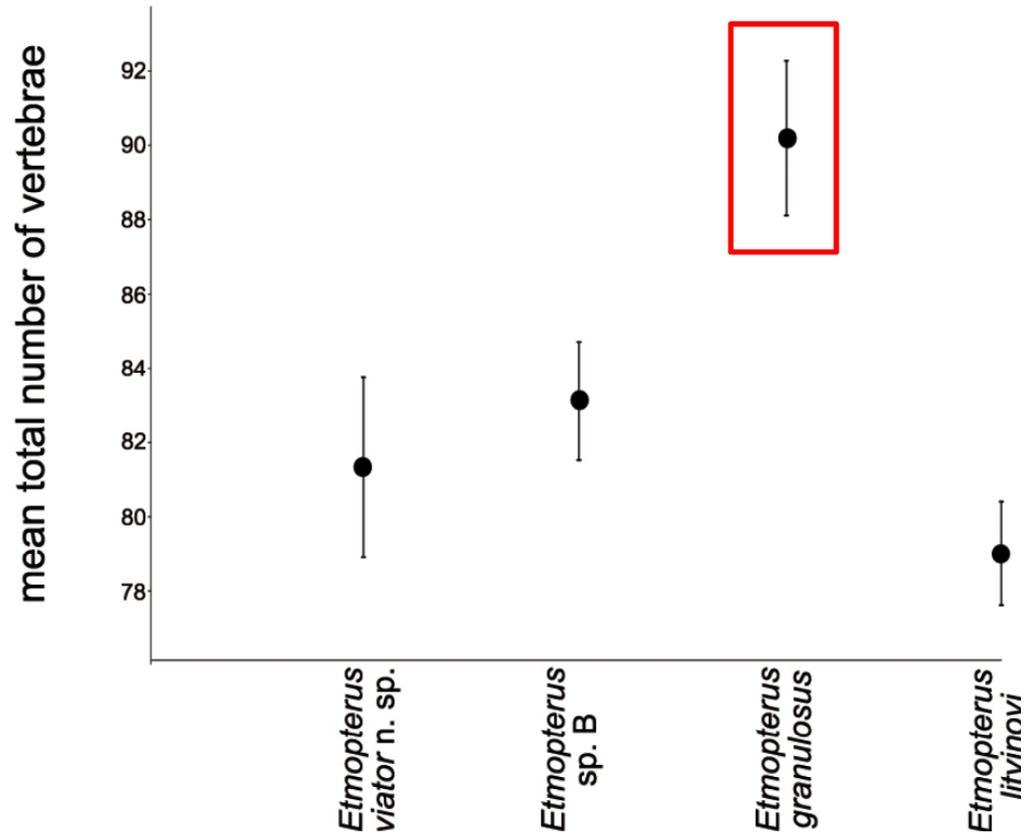
Etmopterus sp. B



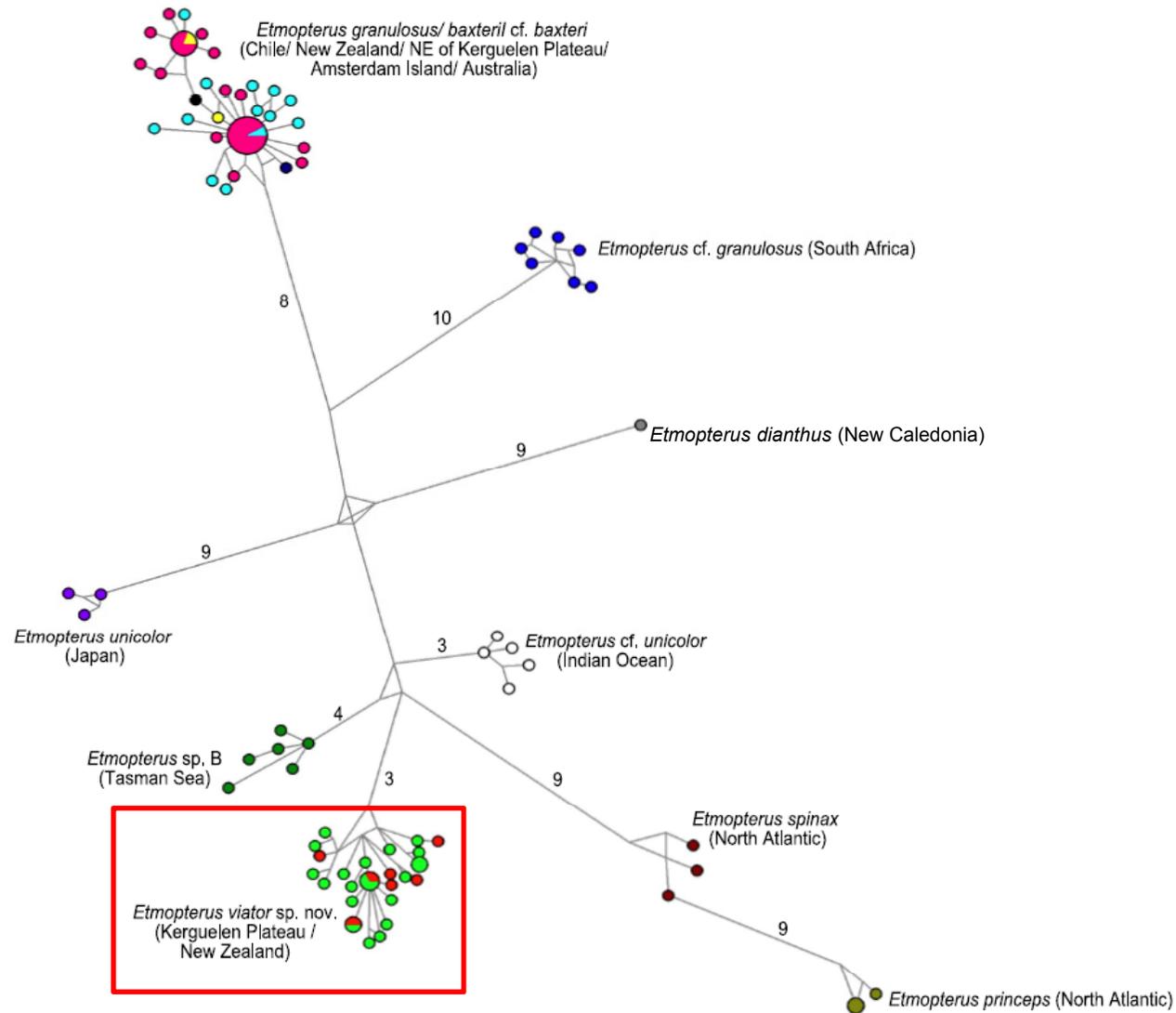
Etmopterus litvinovi

Modified from Compagno et al. 2005

ID of *Etmopterus viator* sp. nov. - meristics



ID of *Etmopterus viator* sp. nov. – barcoding



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Summary

- *Etmopterus viator* sp. nov. is a distinct (cryptic) species
- the species can be morphologically separated from congeners
- DNA barcoding allows identification of *E. viator* sp. nov.
- barcoding reveals presence of *E. viator* sp. nov. at additional site New Zealand

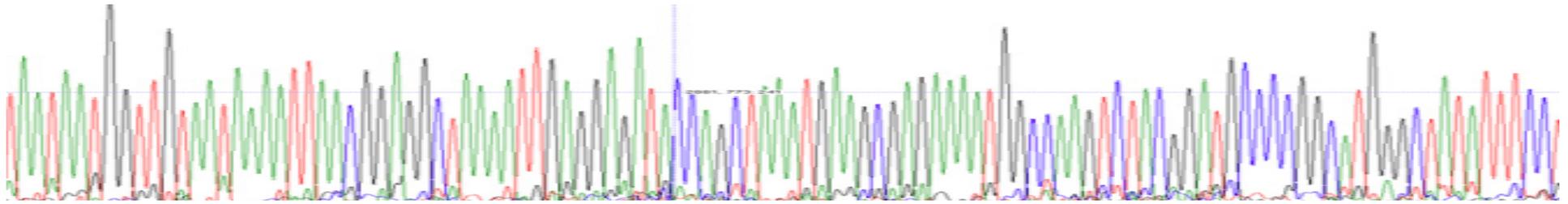
Discussion

- cryptic diversity is high in the *E. spinax* clade:
E. cf. granulatus (South Africa), *E. sp. B*, *E. viator* sp. nov.
- need for descriptions of unknown species
- need for more detailed data on distribution patterns of species

Perspectives

➡ providing an identification tool to the southern hemisphere species

➡ help in monitoring and management strategies of by-catch species.



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- A. Loerz, K. Schnabel, D. Tracey, M. Watson, P. McMillan (NIWA New Zealand)
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