



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

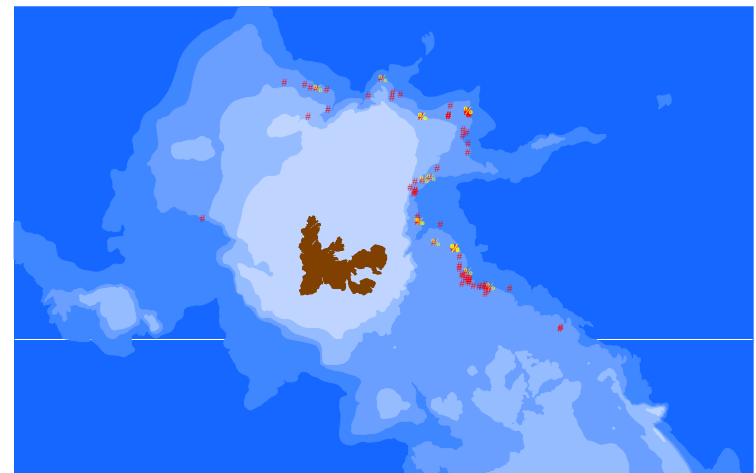
- most speciose family of Squaliformes (dogfish sharks)
- inhabitants of bathyal environment (200 – 2500 m)
- highly endemic vs wide distribution ranges
- size range: 20cm – 110cm
- slow growth and low reproduction rate
- many species are by-catch of commercial deep-sea fisheries
- bioluminescent organs

# Introduction – the Kerguelen Lantern Shark

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



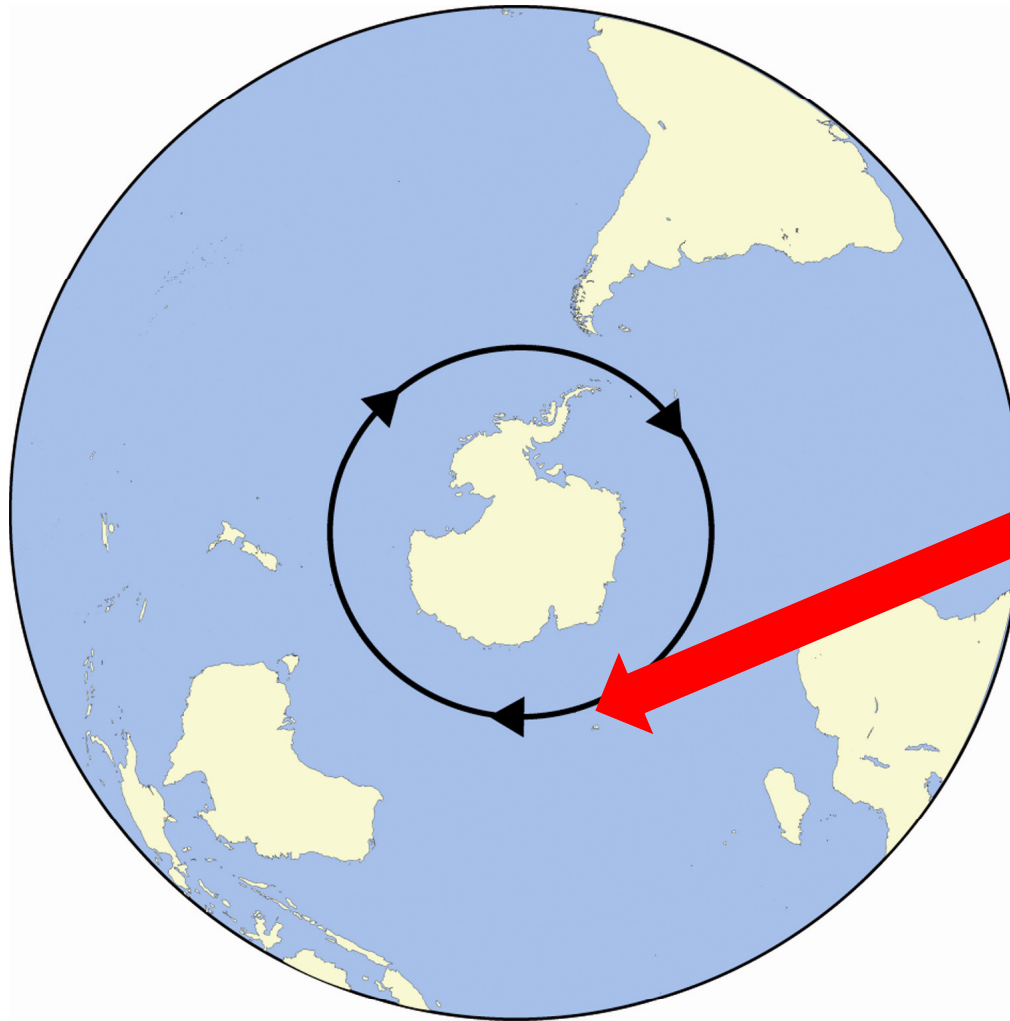
*Etmopterus cf. granulosus*



From: Duhamel et al. (2005)

➡ member of a morphologically uniform group with unresolved taxonomy

## Introduction – the Kerguelen Lantern Shark



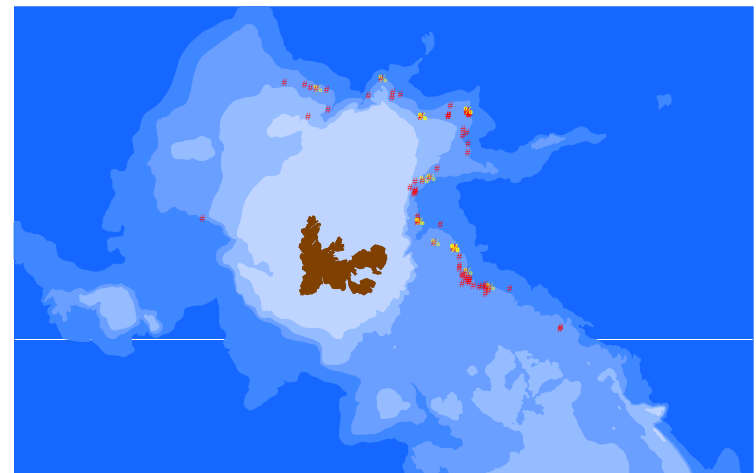
Kerguelen Plateau:  
Southern Indian Ocean,  
lies within CAC,  
French territorial waters

# Introduction – the Kerguelen Lantern Shark

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*Etmopterus cf. granulosus*



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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

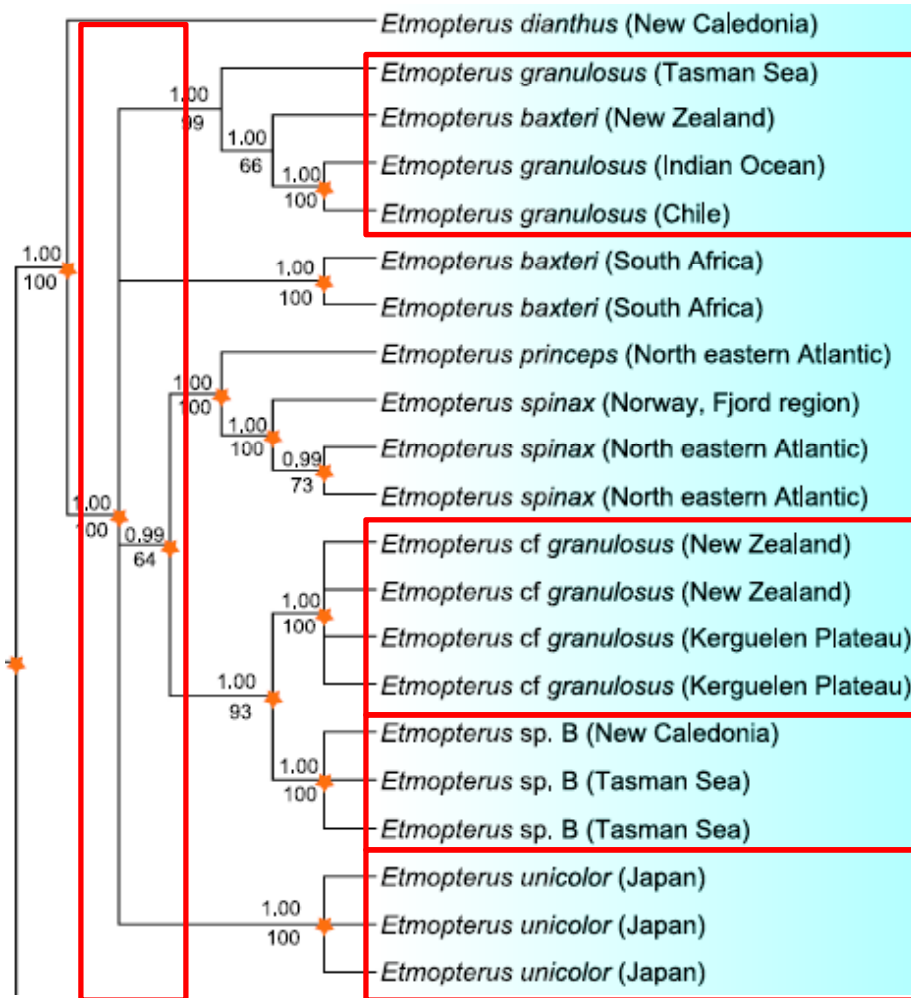
Identification

Summary

Discussion

Perspectives

# Molecular Phylogeny – *Etmopterus spinax* clade



sequences data:

- portion of RAG1 (nuclear, 1454 bp)
- COI (mtDNA, 655 bp)
- 12S- partial 16S, tRNA<sup>Val</sup> and tRNA<sup>Phe</sup> (mtDNA, 2606 bp)

## Molecular Phylogeny – implications

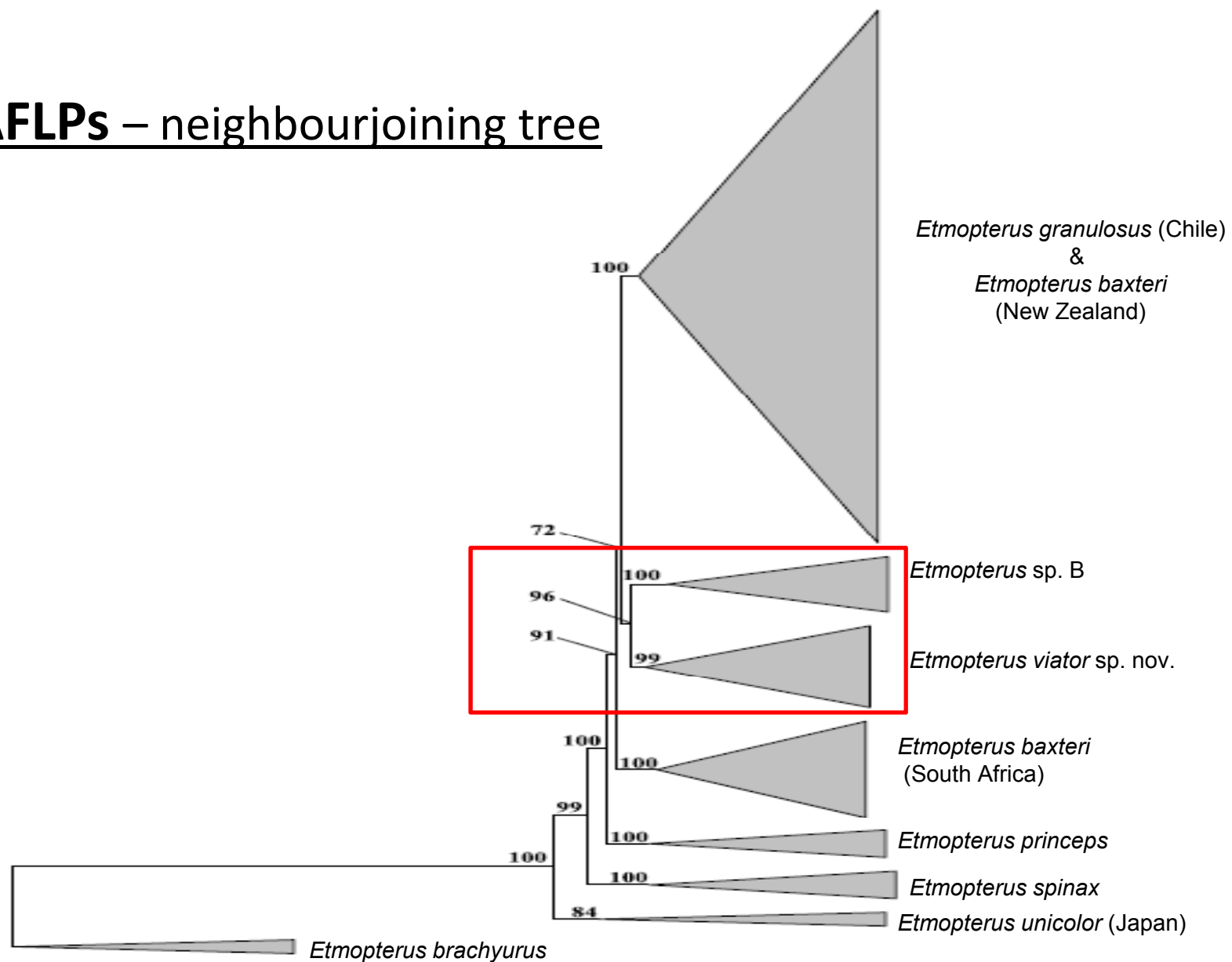
- ➡ *E. sp B* is not synonym to *E. unicolor*
- ➡ the Kerguelen Lantern Shark (*E. cf. granulosus*) forms a distinct clade. Cryptic species?
- ➡ further phylogenetic analyses based on more samples



# **AFLPs – Amplified Fragment Length Polymorphisms**

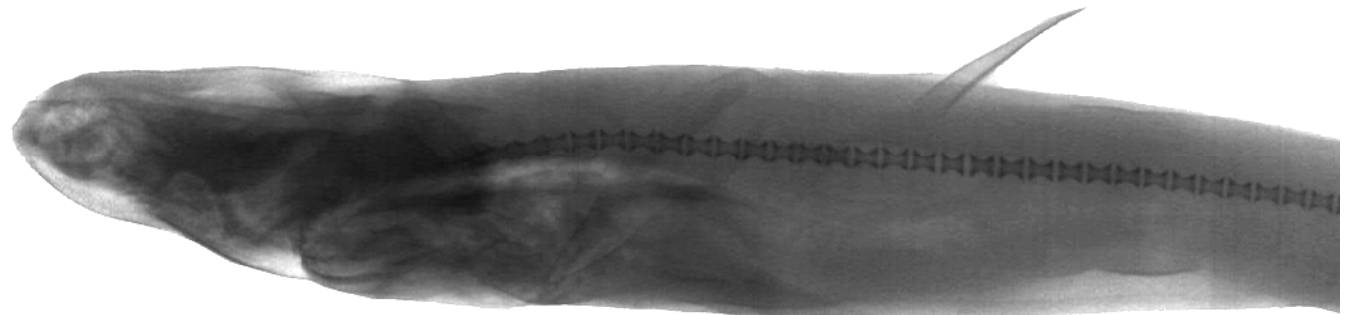
- population genetic approach
- informative on inter- and intraspecific level
- matrix comprising 2655 loci
- re-evaluating phylogeny of the *E. spinax* clade

## 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



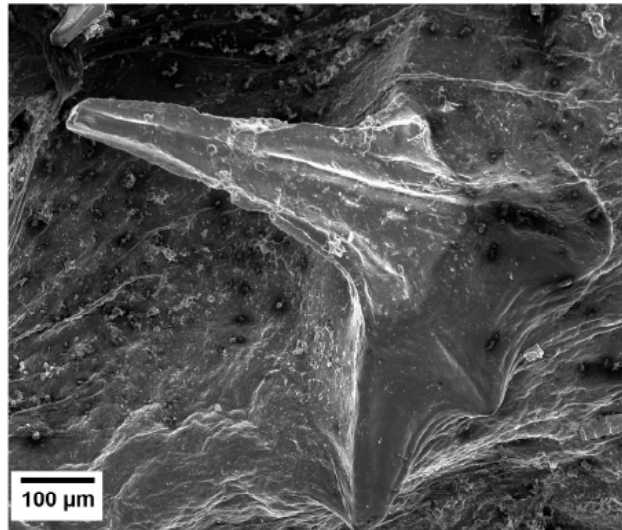
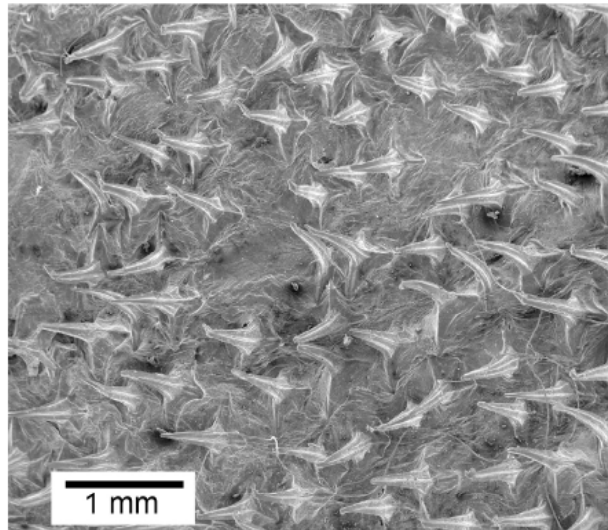
*E. viator* sp. nov.



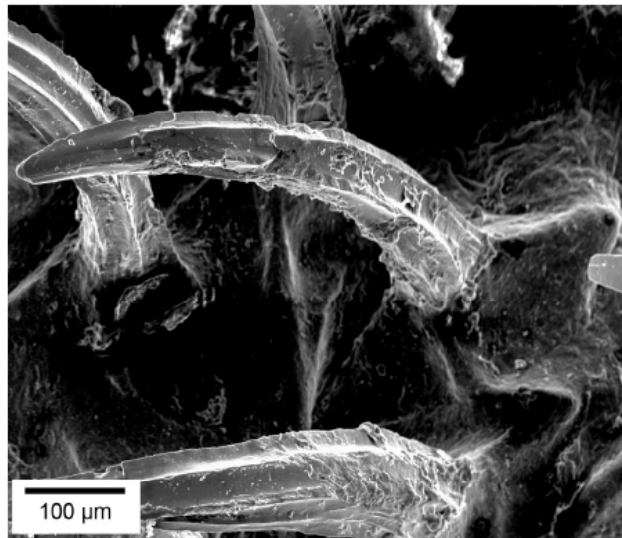
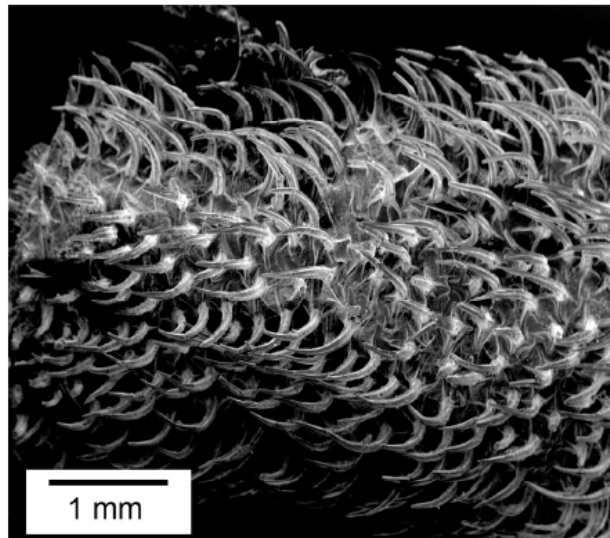
*E. sp. B*



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



*E. viator* sp.nov.

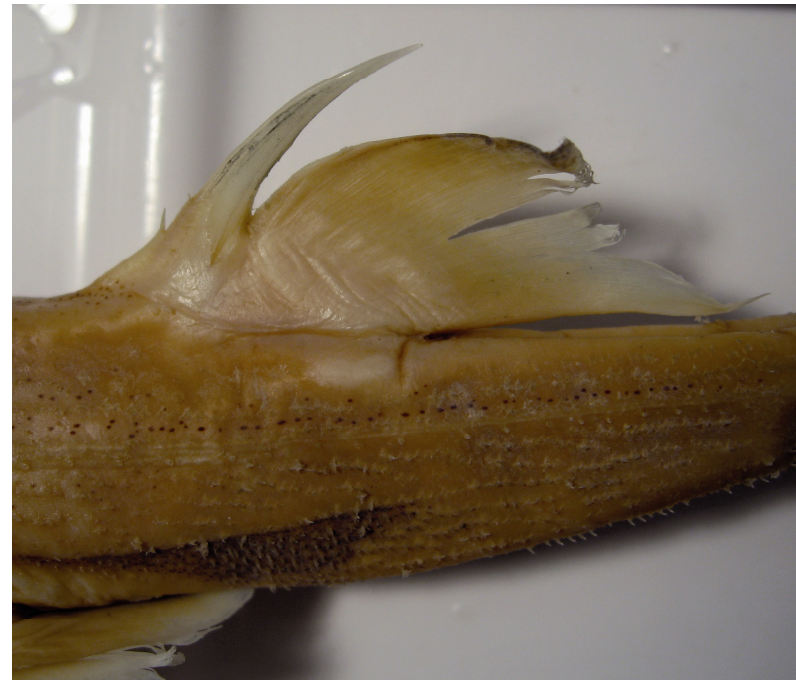


*E. sp. B*

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



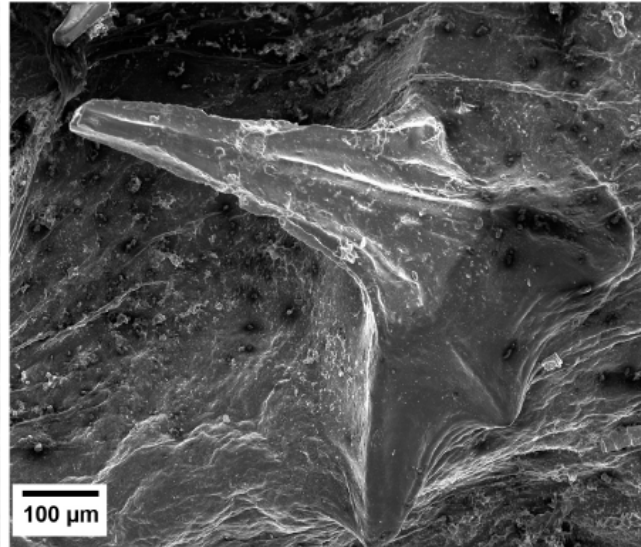
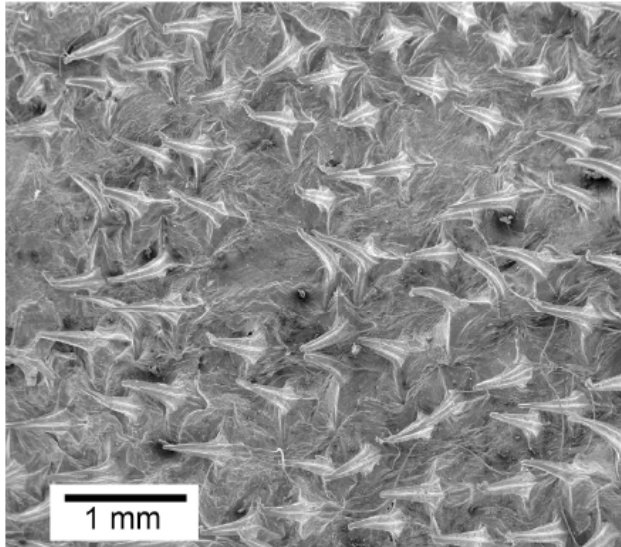
*E. viator* sp.nov.



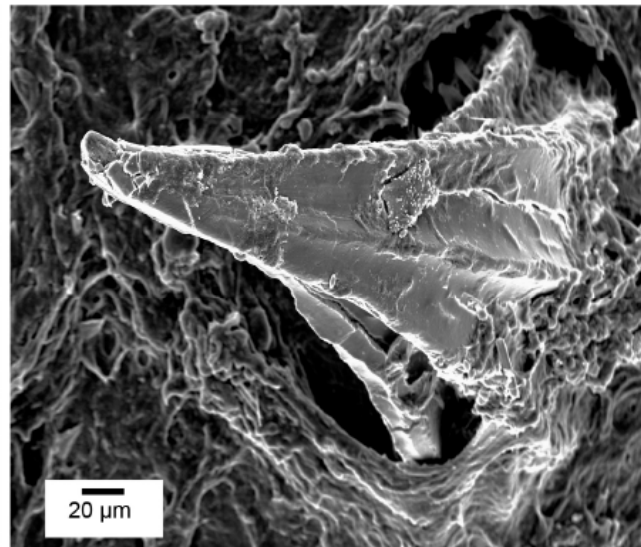
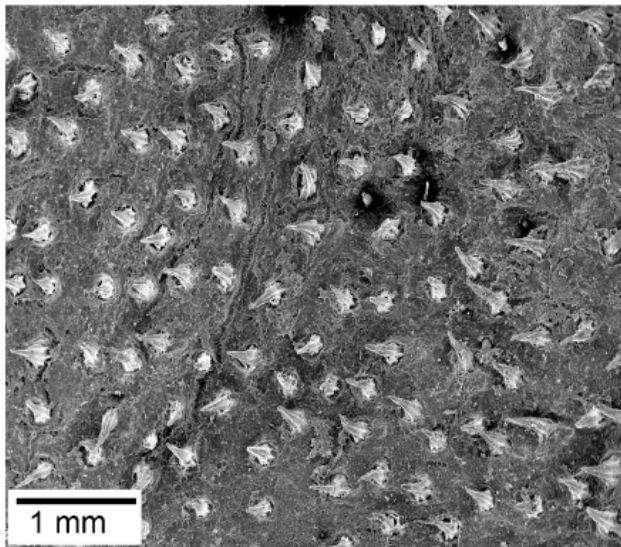
*E. granulosus* (holotype)



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

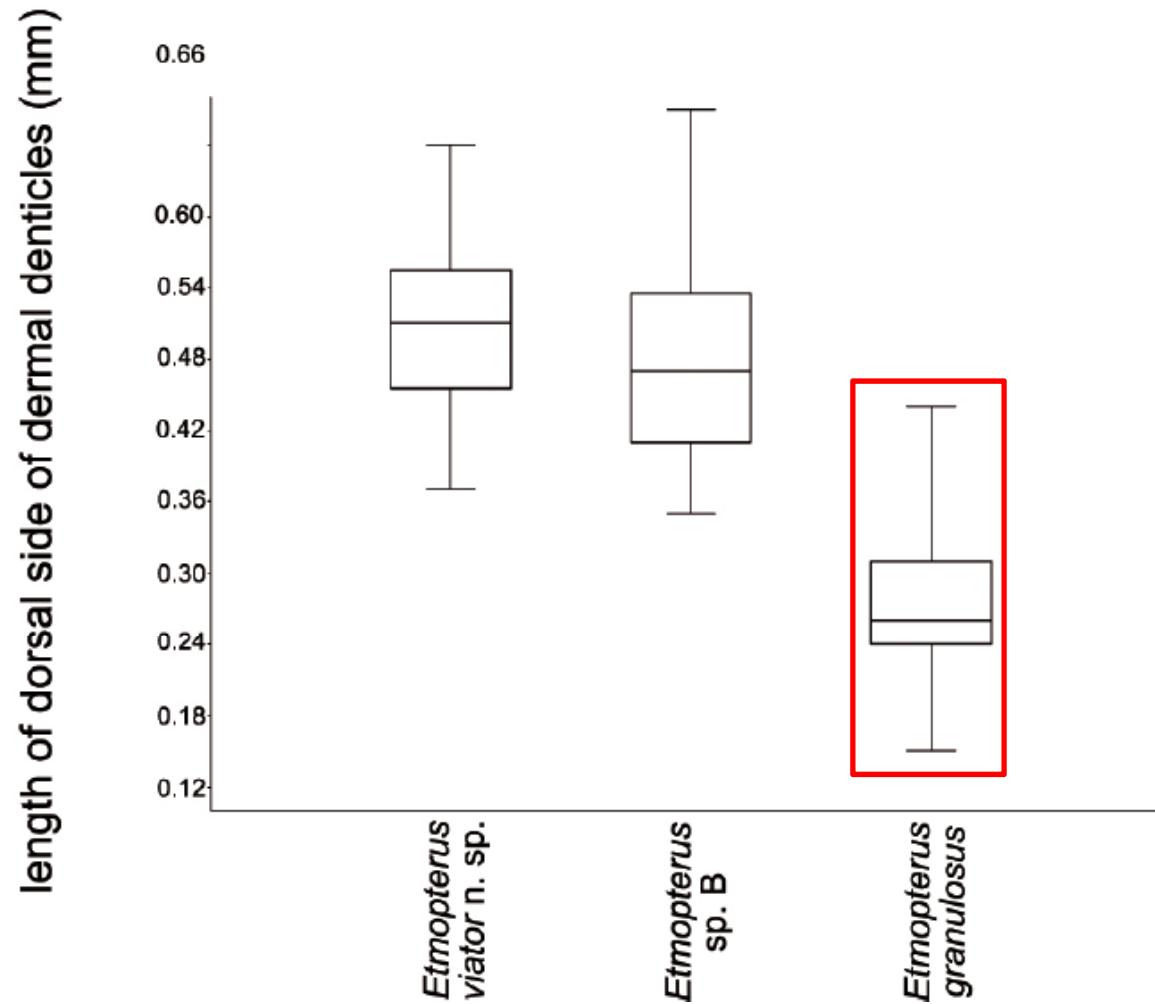


*E. viator* sp.nov.



*E. granulosus*

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

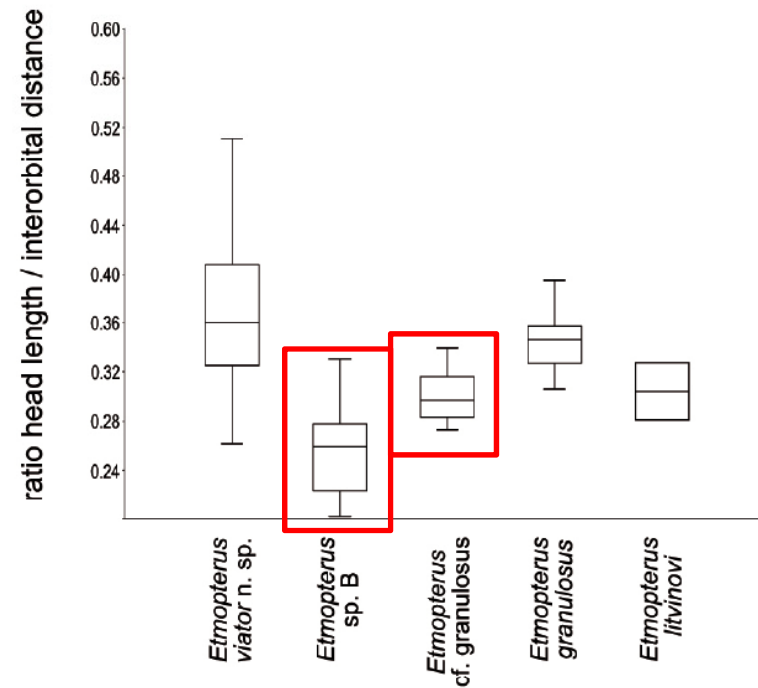
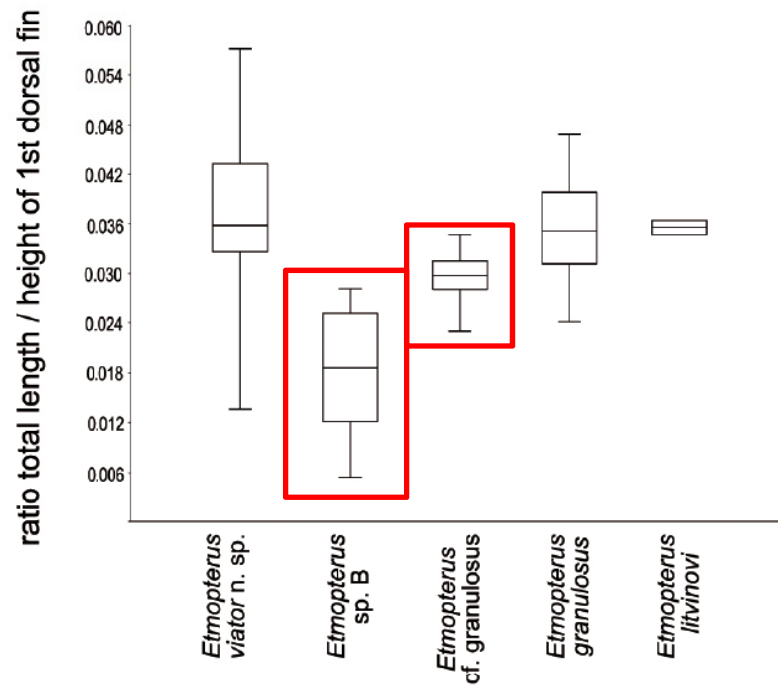




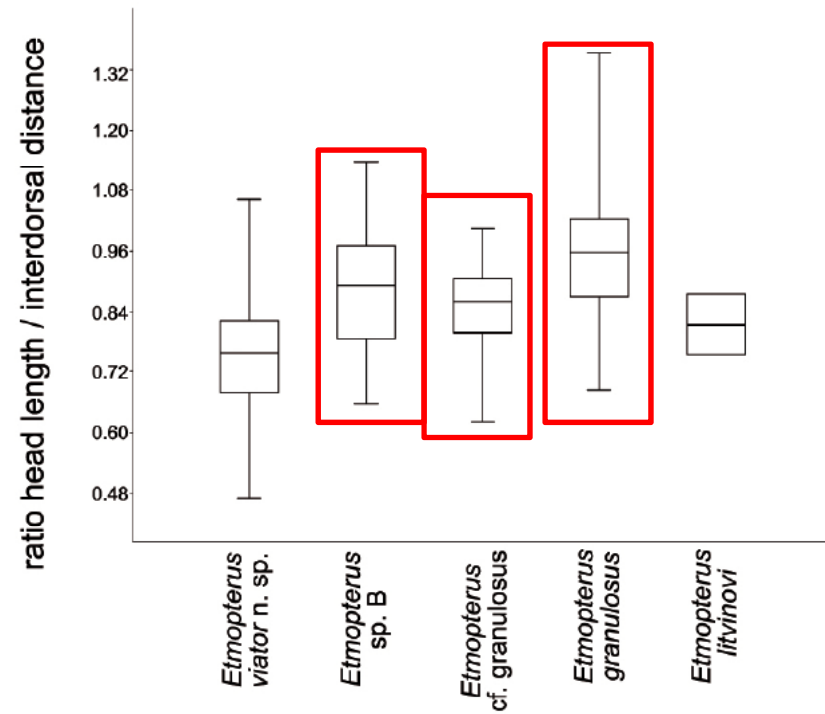
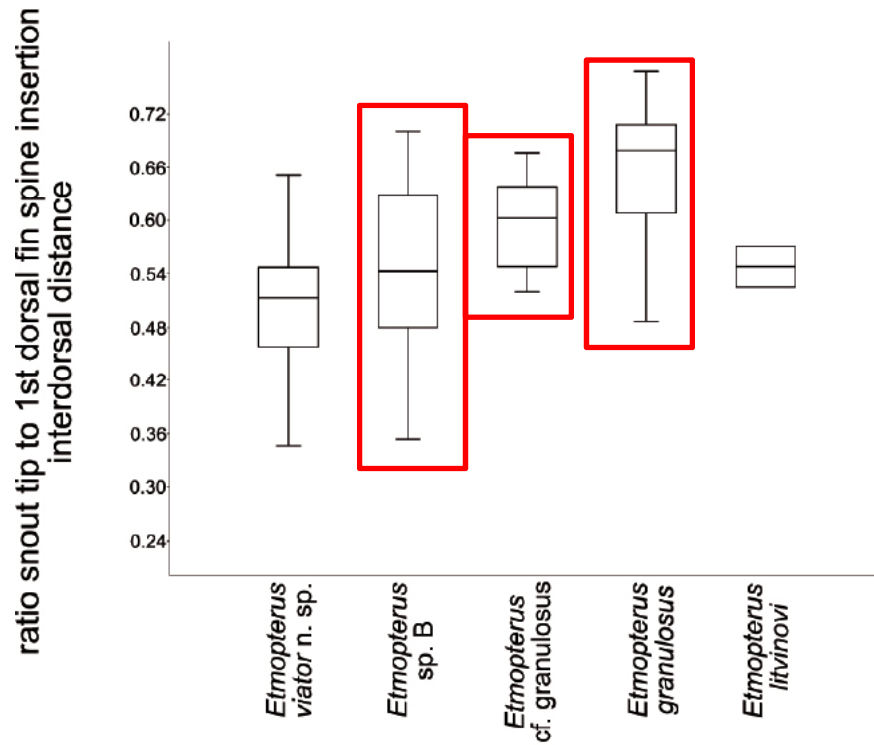
# ID of *Etmopterus viator* sp. nov. - morphometrics

- 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

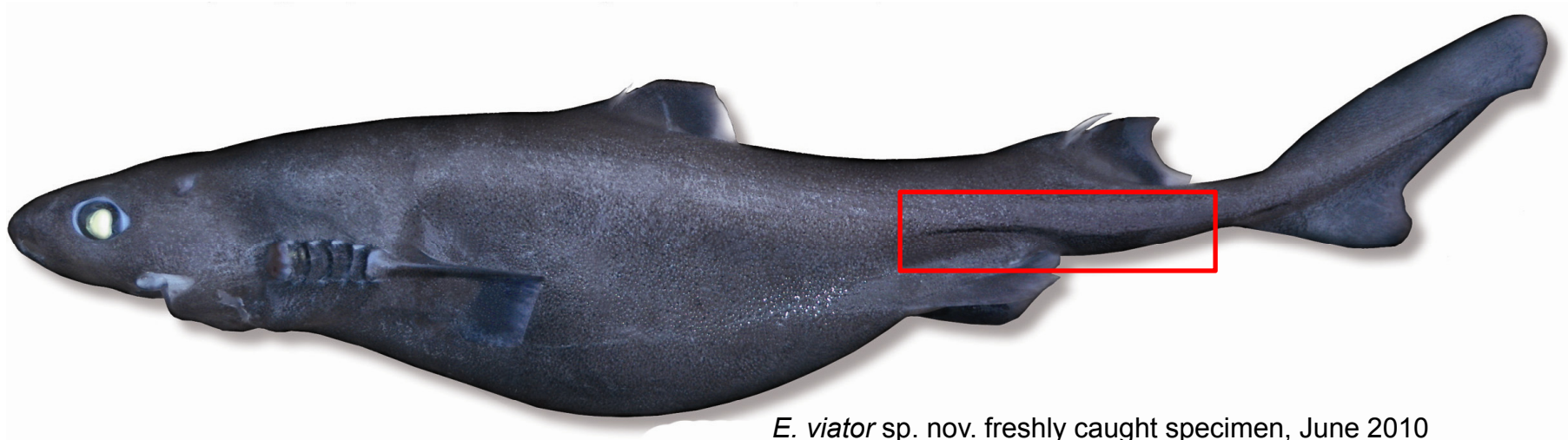
# ID of *Etmopterus viator* sp. nov. - morphometrics



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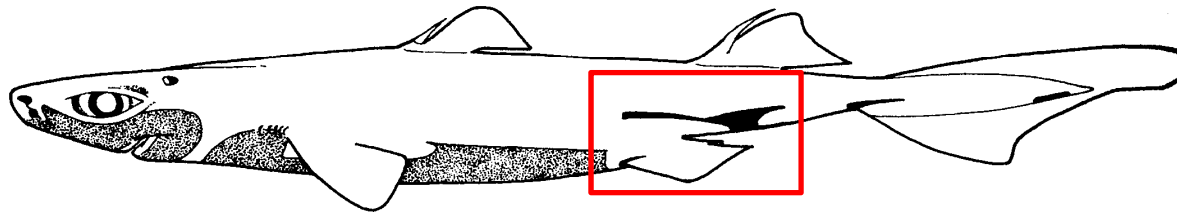


## ID of *Etmopterus viator* sp. nov. – flank markings

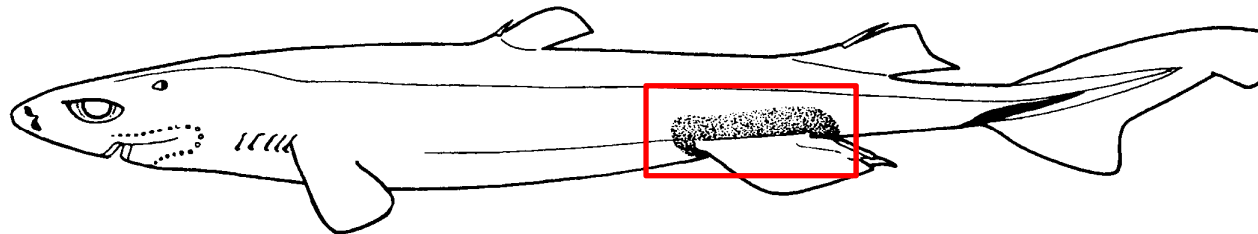


*E. viator* sp. nov. freshly caught specimen, June 2010

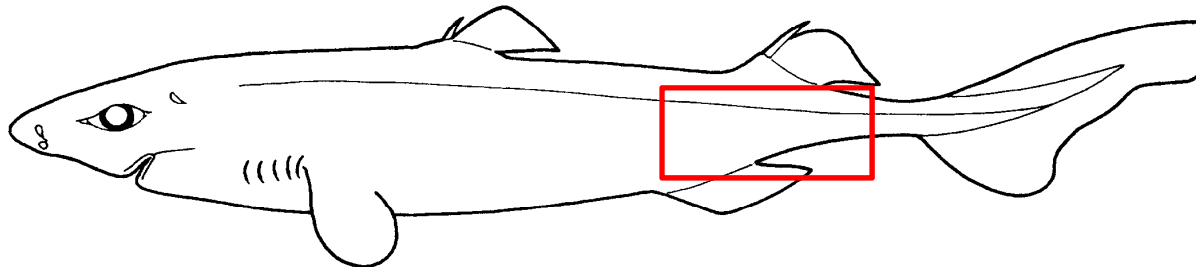
## ID of *Etmopterus viator* sp. nov. – flank markings



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



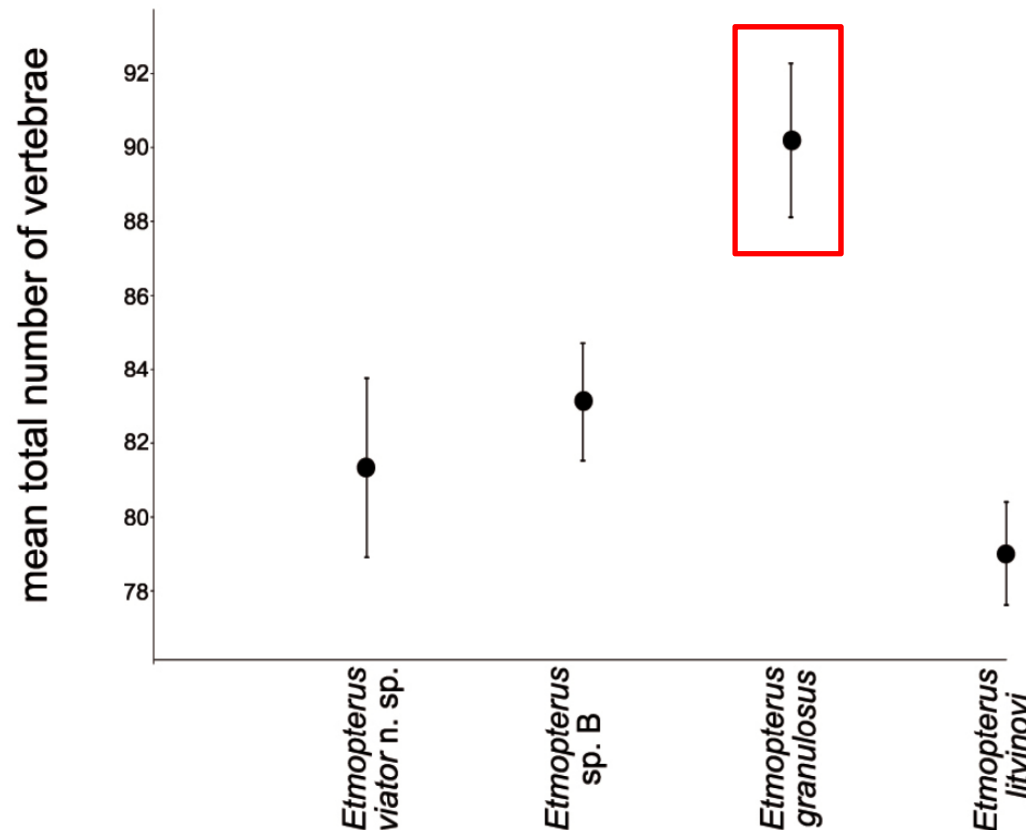
*Etmopterus* sp. B



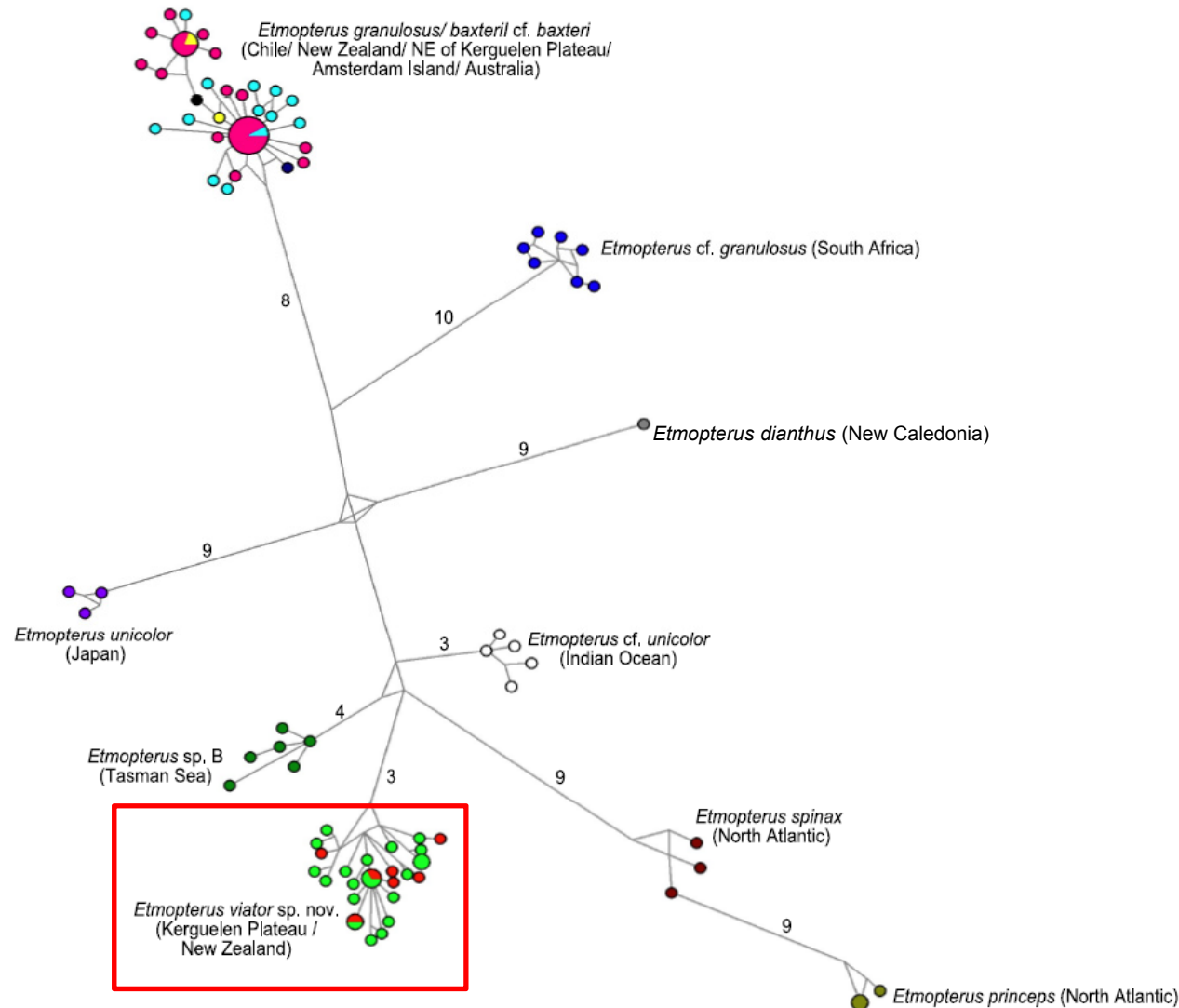
*Etmopterus litvinovi*

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

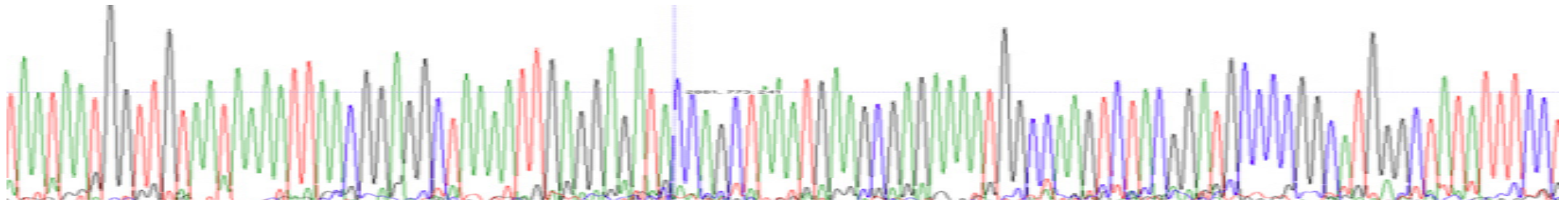


## Discussion

- 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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