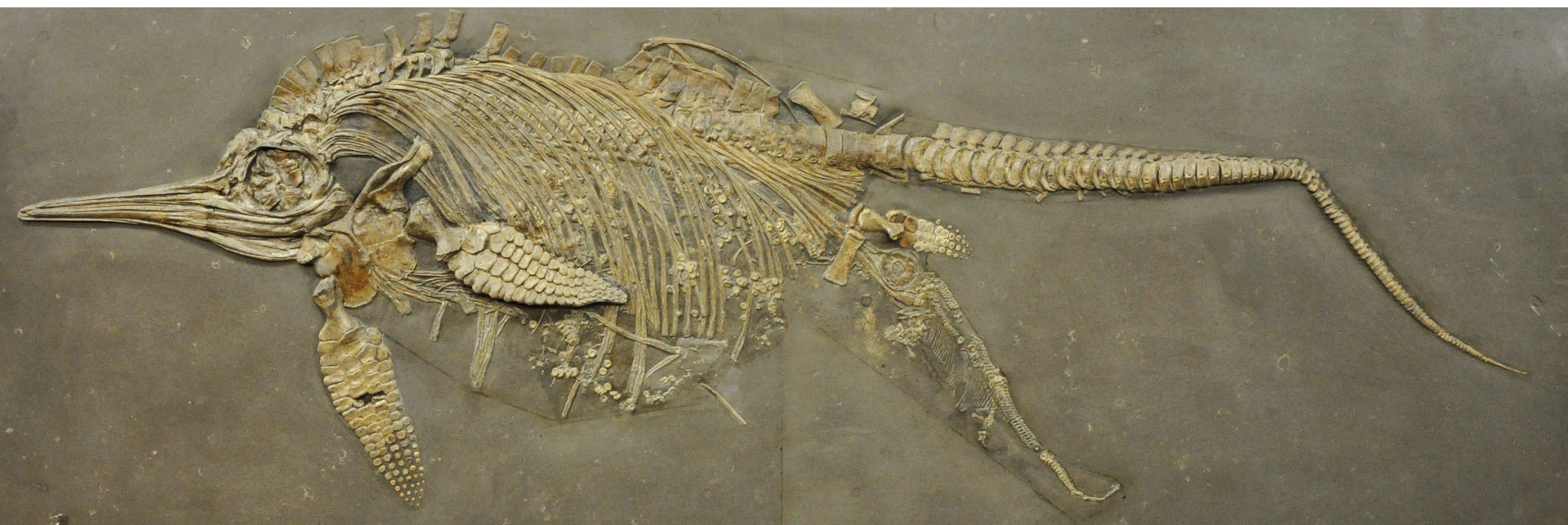


Comment reconstituer l'anatomie et mode de vie des reptiles marins ? 🤔



Comment reconstituer l'anatomie et mode de vie des reptiles marins ? 🤔



LIÈGE université
GÉOLOGIE

Prof. Valentin Fischer

✉ v.fischer@uliege.be

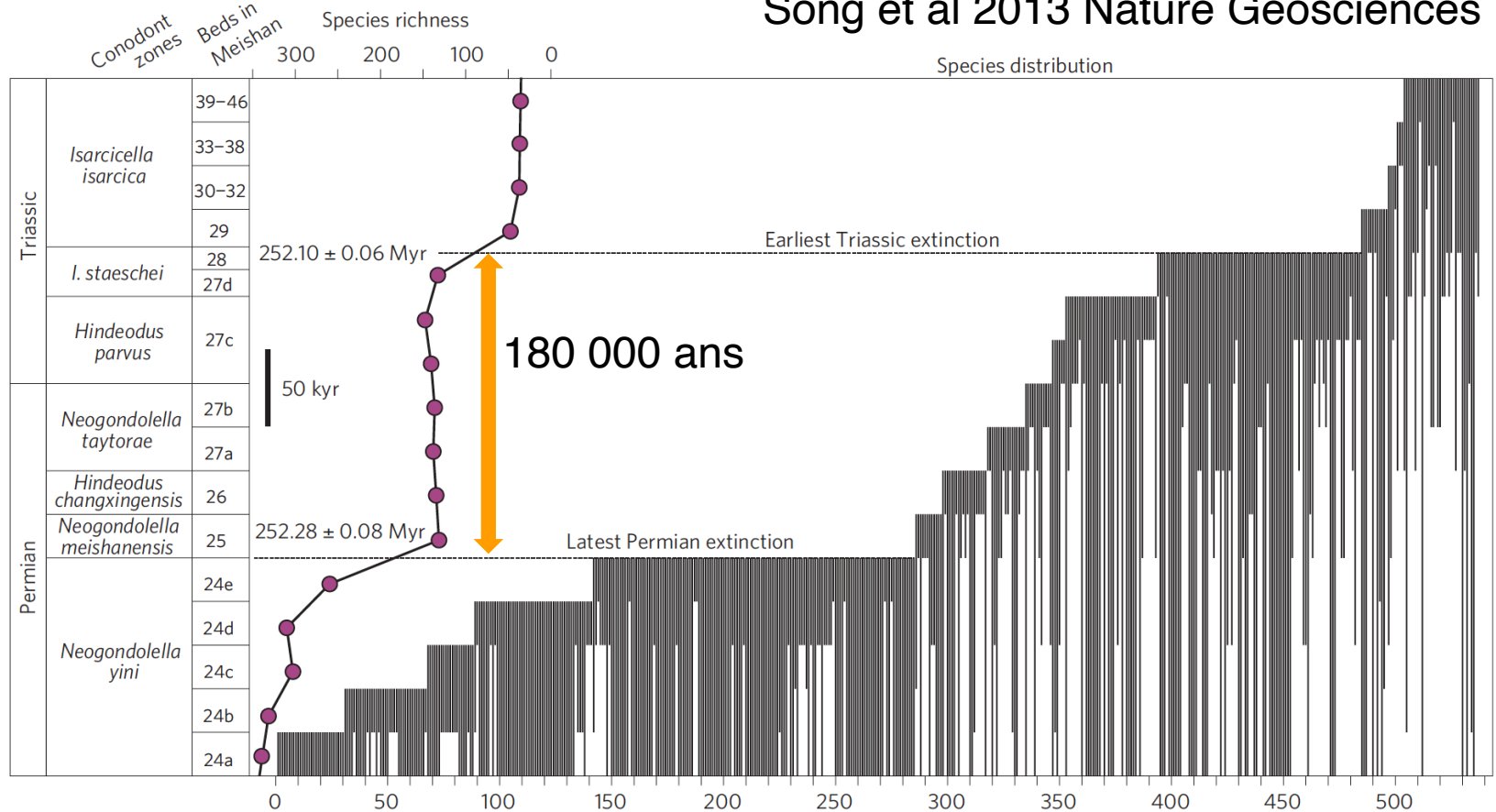
🐦 @Val_fisch

***Il y a 252 millions d'années.
Des millions de m³ de basaltes
recouvrent la Sibérie, relâchant
des gigatonnes de gaz mortels.***



Plus de 90% de la biodiversité animale disparaît, dans un événement qui sera la plus grande extinction de tous les temps.

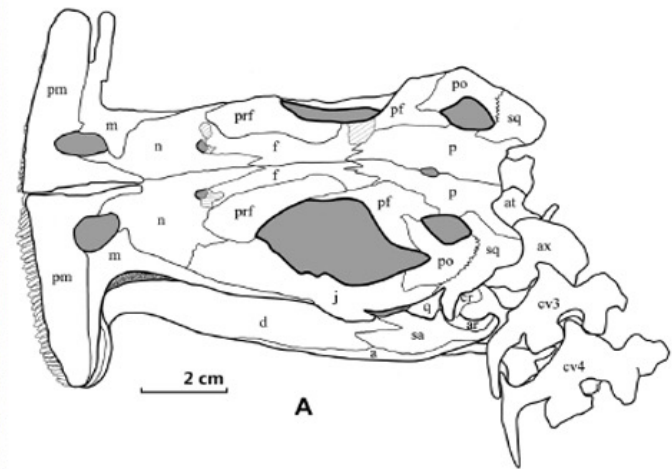
Song et al 2013 Nature Geosciences







© Chirinos 2014; Neenan 2014 ; scan
© Fischer 2020

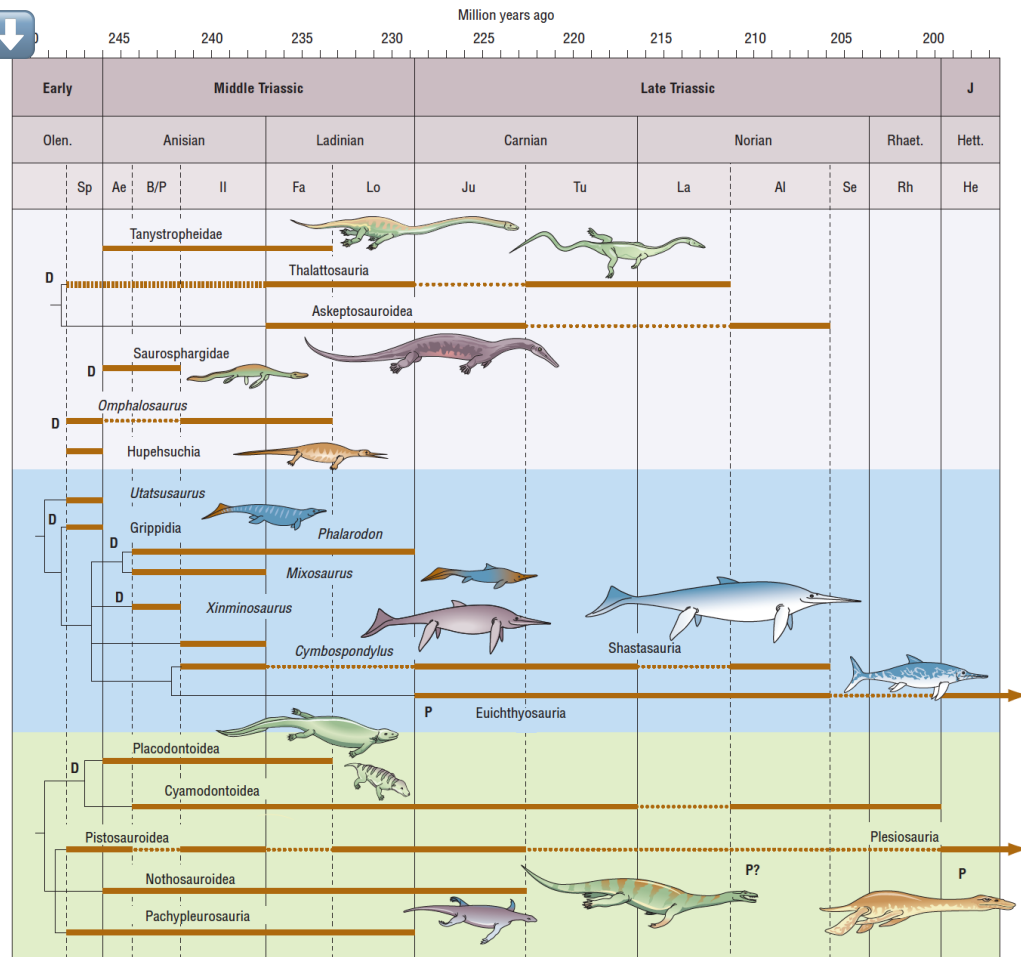


Atopodentatus unicus
 Triassic China. Chun
 et al 2016 Sci. Adv.
 © G. Ugueto

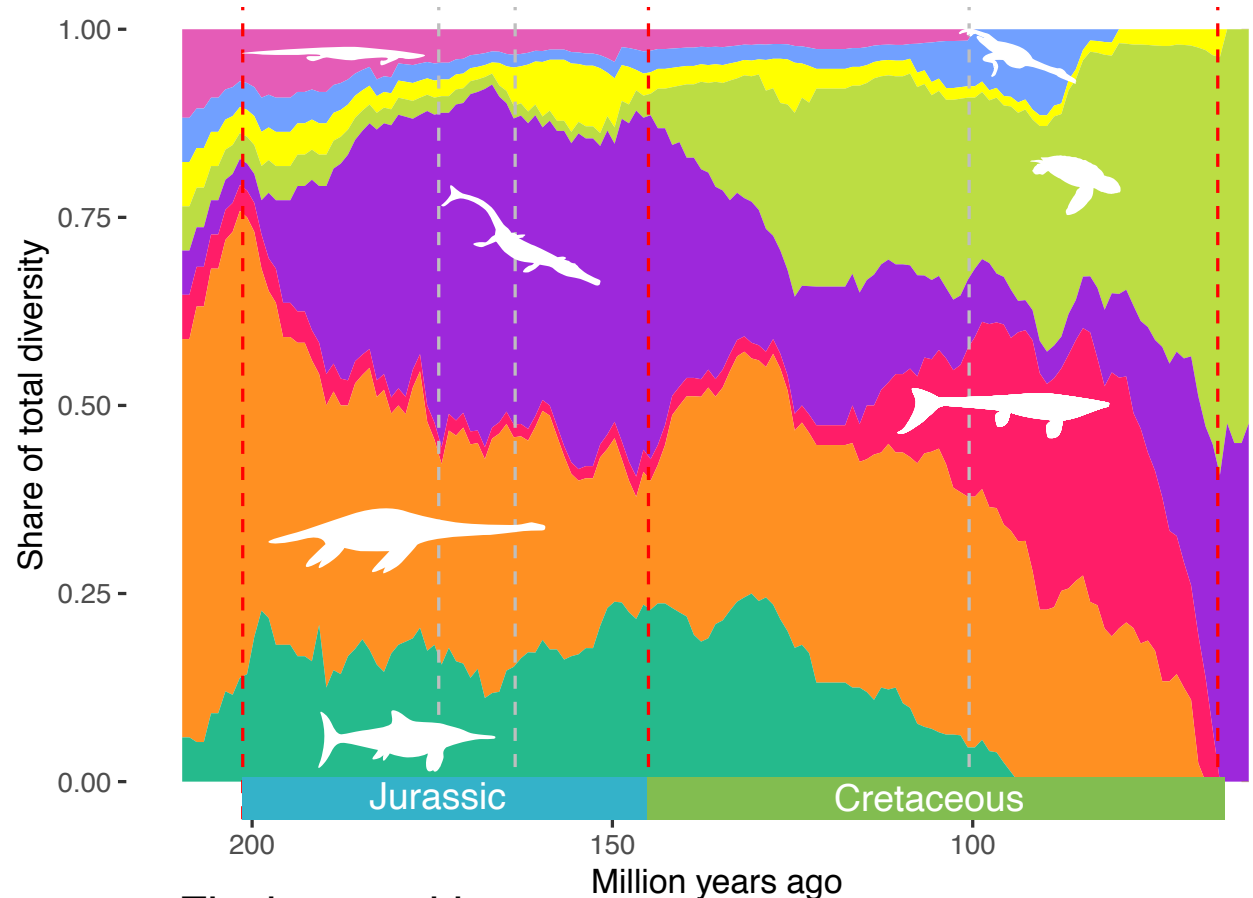
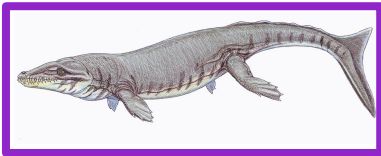


Gabriel Ugueto
 Concept Art
 Illustration & Graphic Design

De drôles d'océans, remplis de reptiles

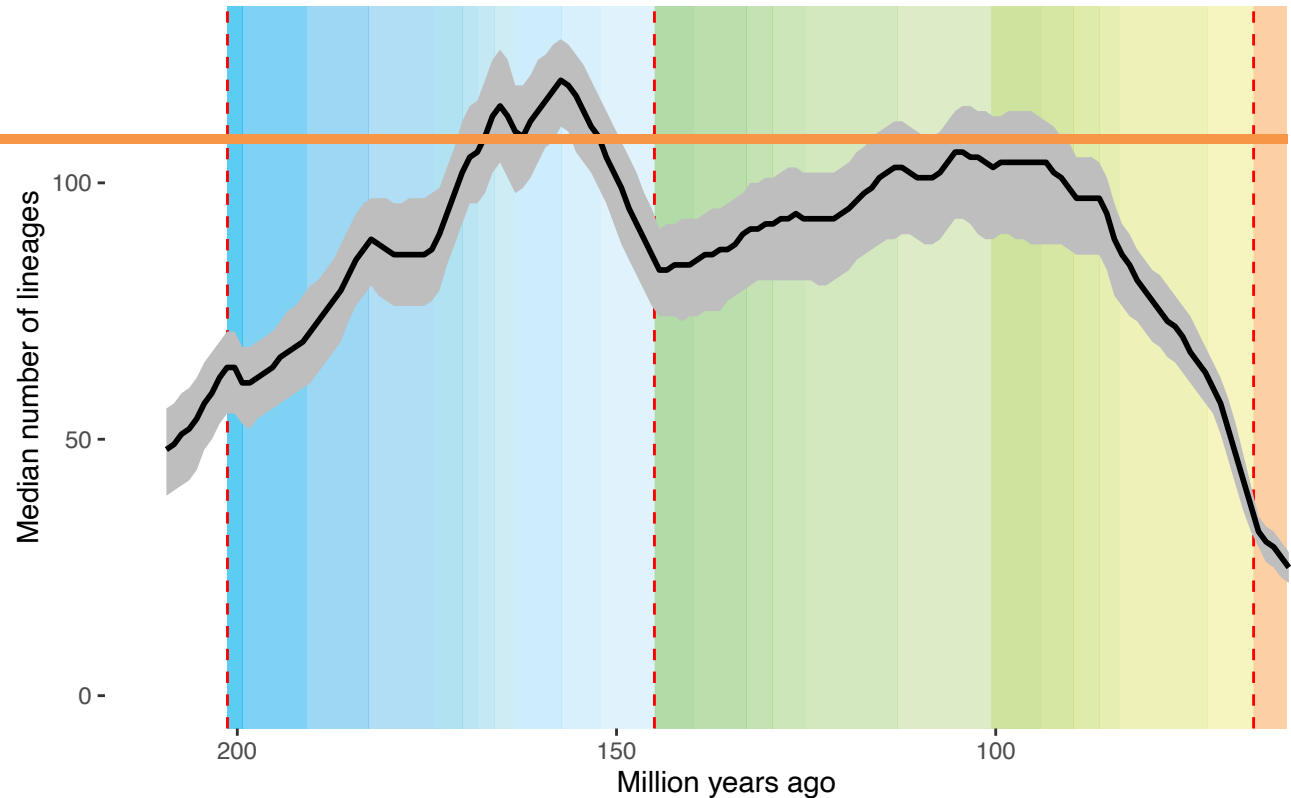


De drôles d'océans, remplis de reptiles

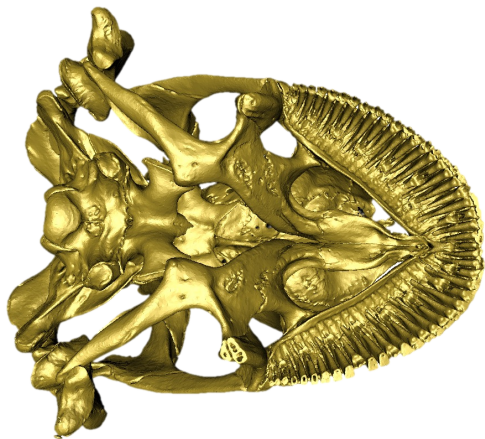
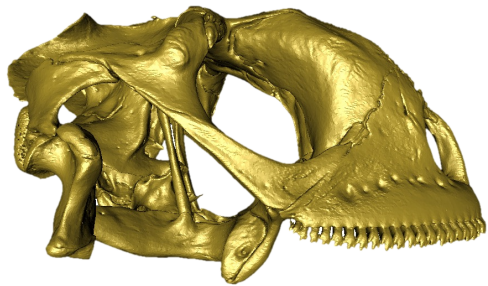


De drôles d'océans, remplis de reptiles

Diversité →
des
mammifères
marins
actuels

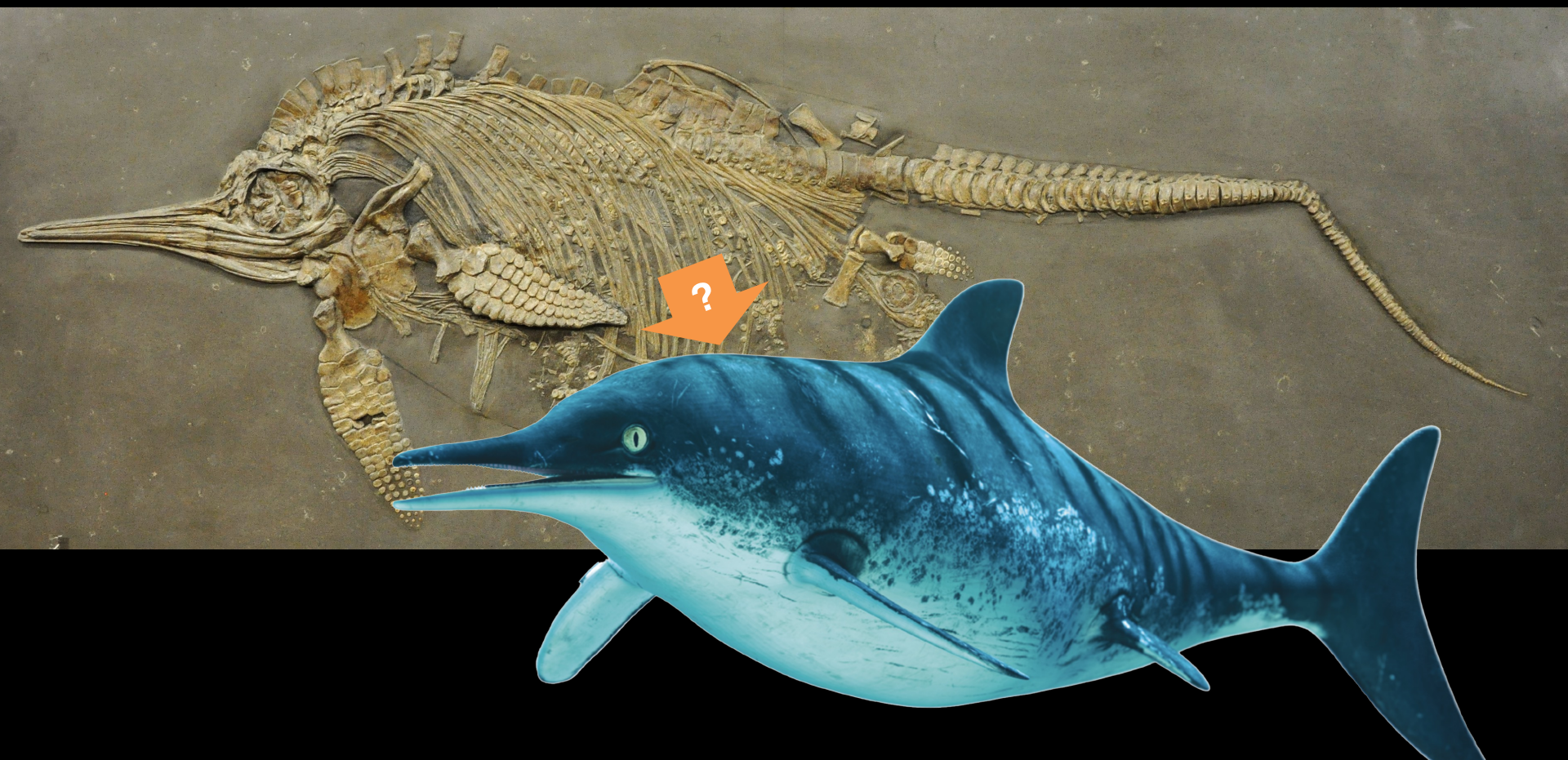


Les reptiles marins sont un phénomène très rare aujourd'hui



Iguane marin *[Amblyrhynchus cristatus](#)*
MicroCT depuis phenome10K.org

Comment reconstituer l'anatomie et mode de vie des reptiles marins ? 🤔



Comment reconstituer l'anatomie et mode de vie des reptiles marins ? 🤔

Indices anatomiques 🦴
et physiques 👁️

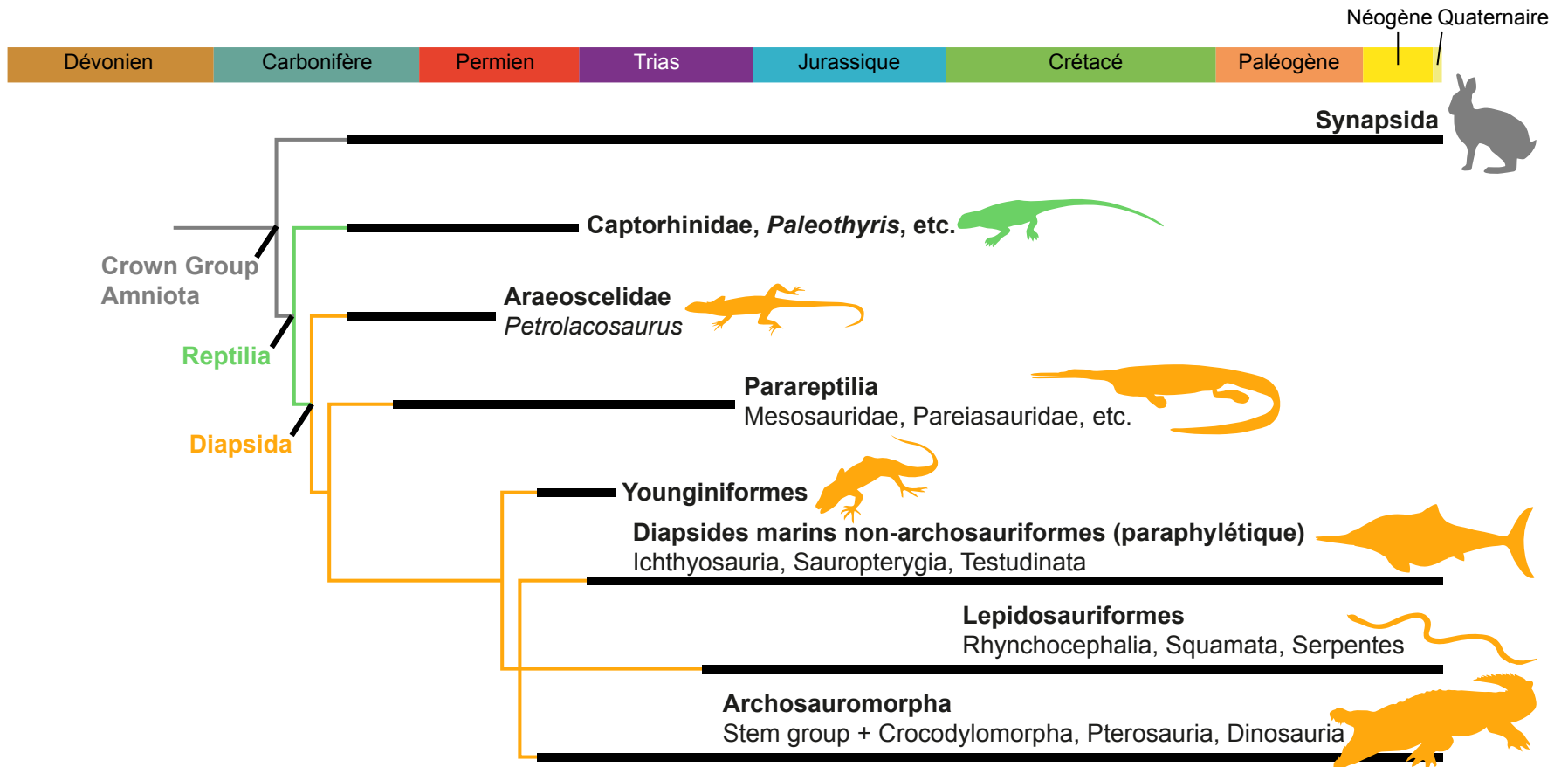
3D et statistiques 🧑💻

Comment reconstituer l'anatomie et mode de vie des reptiles marins ? 🤔

- Indices anatomiques 🦴
et physiques 👁️

3D et statistiques 🧑💻

Les ichthyosaures sont un groupe de reptiles totalement disparu





BBC News (UK) ✓

@BBCNews



Rutland sea dragon dinosaur dolphin
fossil is largest found in UK

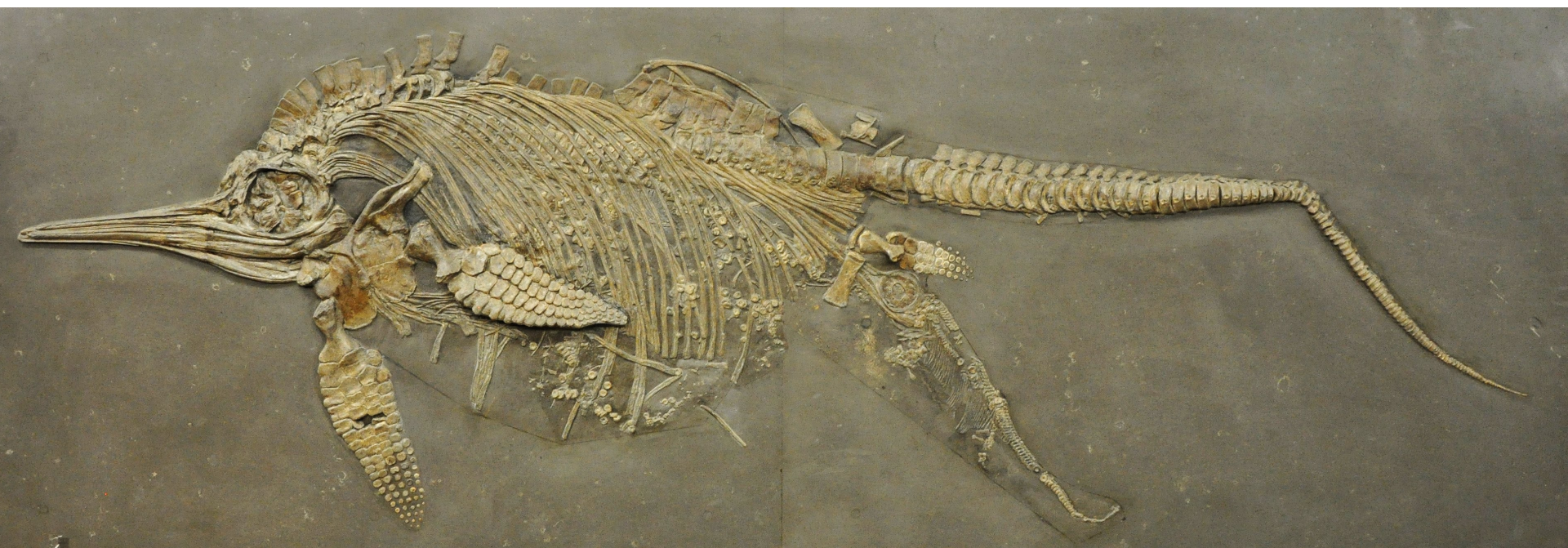


Les super-pouvoirs des ichthyosaures:

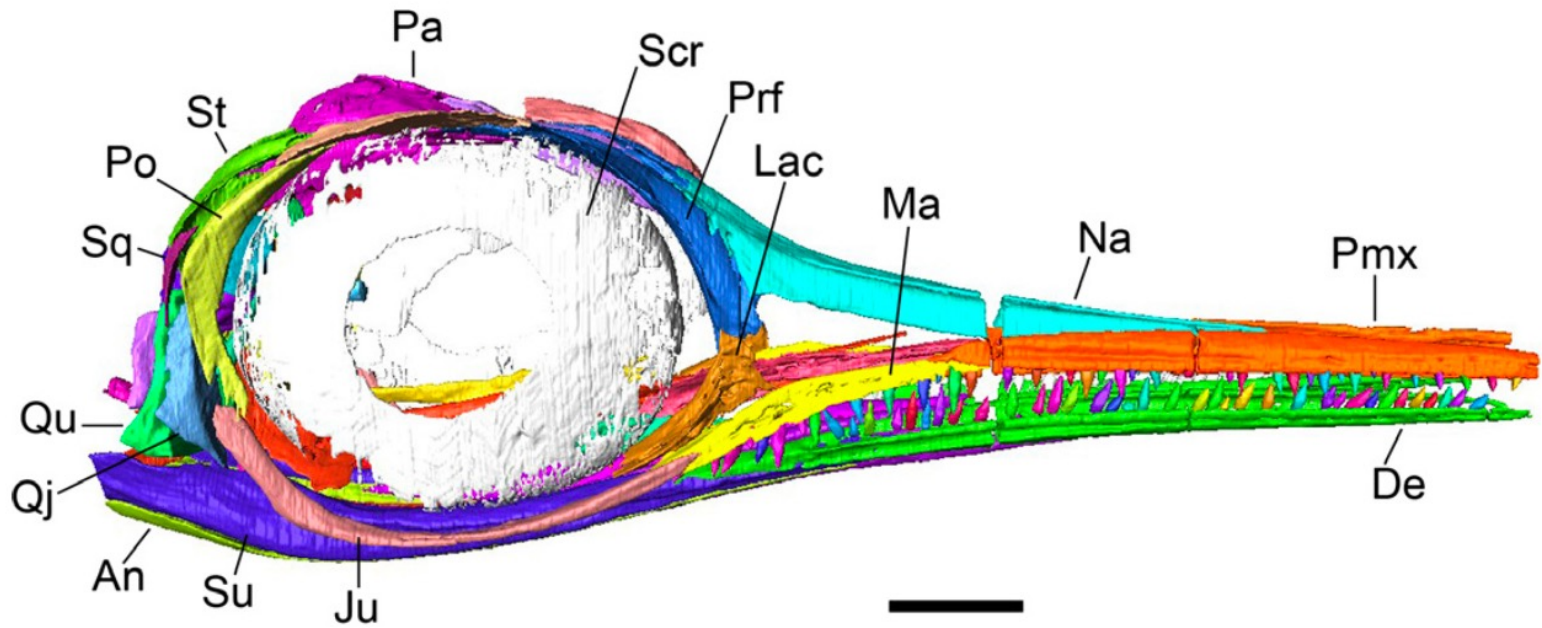


Stenopterygius
© S. Sachs; MNHNL

Les super-pouvoirs des ichthyosaures: 1 – un corps en forme de torpille



Stenopterygius
© S. Sachs; MNHNL



Hauffiopteryx
Marek et al 2015

C



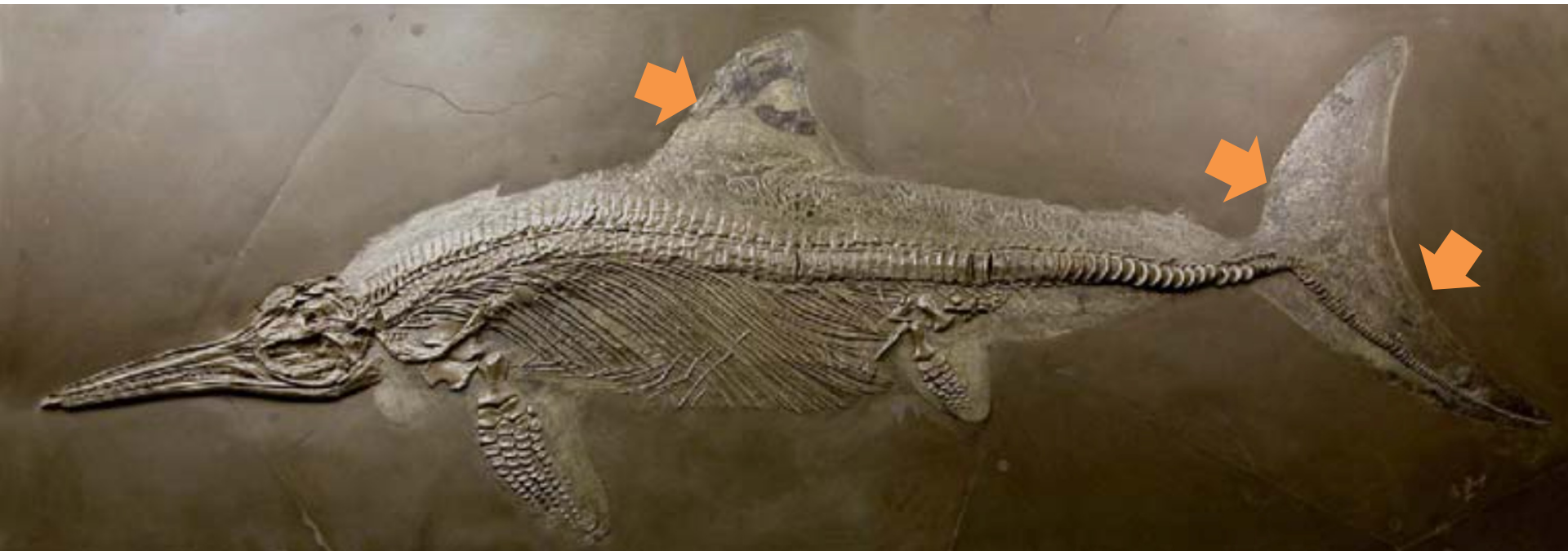
Acamptonectes
Fischer et al
2012

diapophysis

parapophysis

posterolateral
lamella

Les super-pouvoirs des ichthyosaures: 1 – un corps en forme de torpille



Stenopterygius
Lingham-Soliar & Plodowski 2007



Eel



Chahusaurus

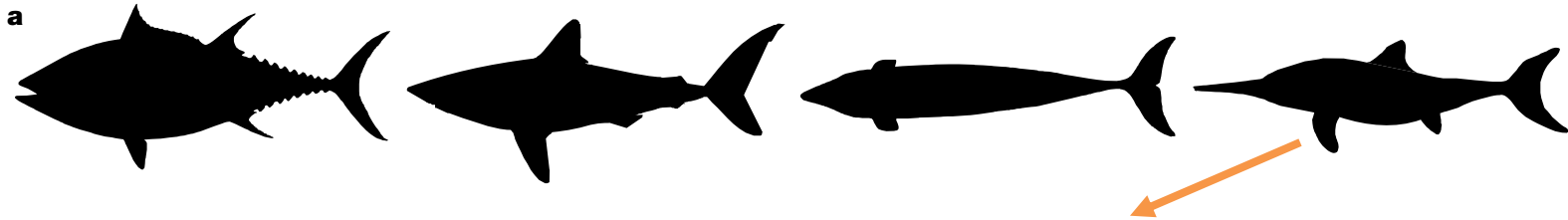


Tuna

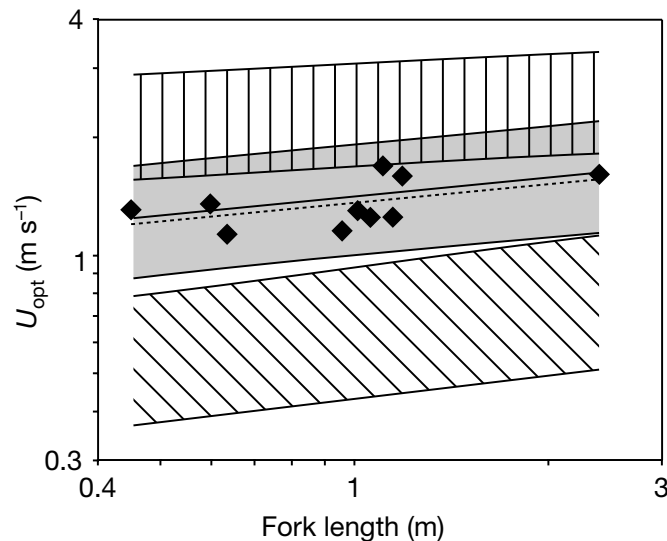


Stenopterygius

Les super-pouvoirs des ichthyosaures: 1 – un corps en forme de torpille

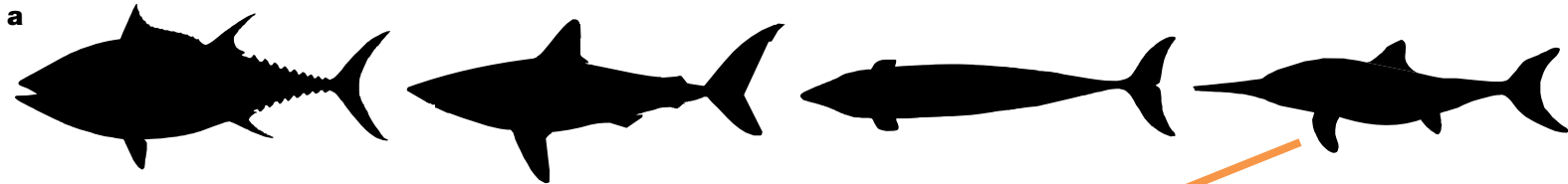


Vitesse de croisière
similaire aux
poissons rapides
comme les thons et
les marlins

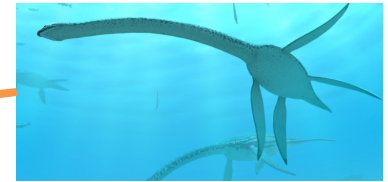
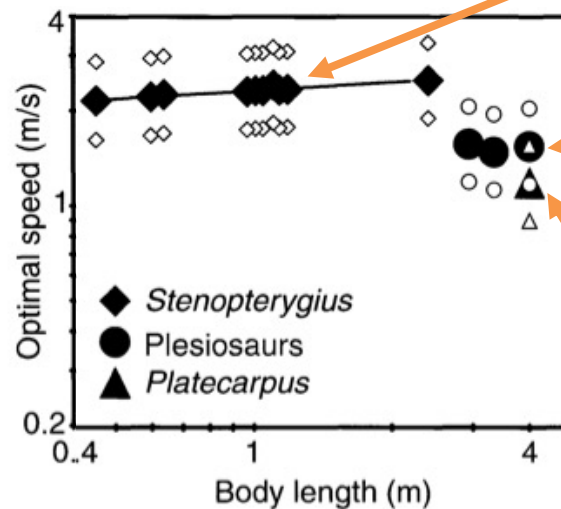


Motani 2002a

Les super-pouvoirs des ichthyosaures: 1 – un corps en forme de torpille



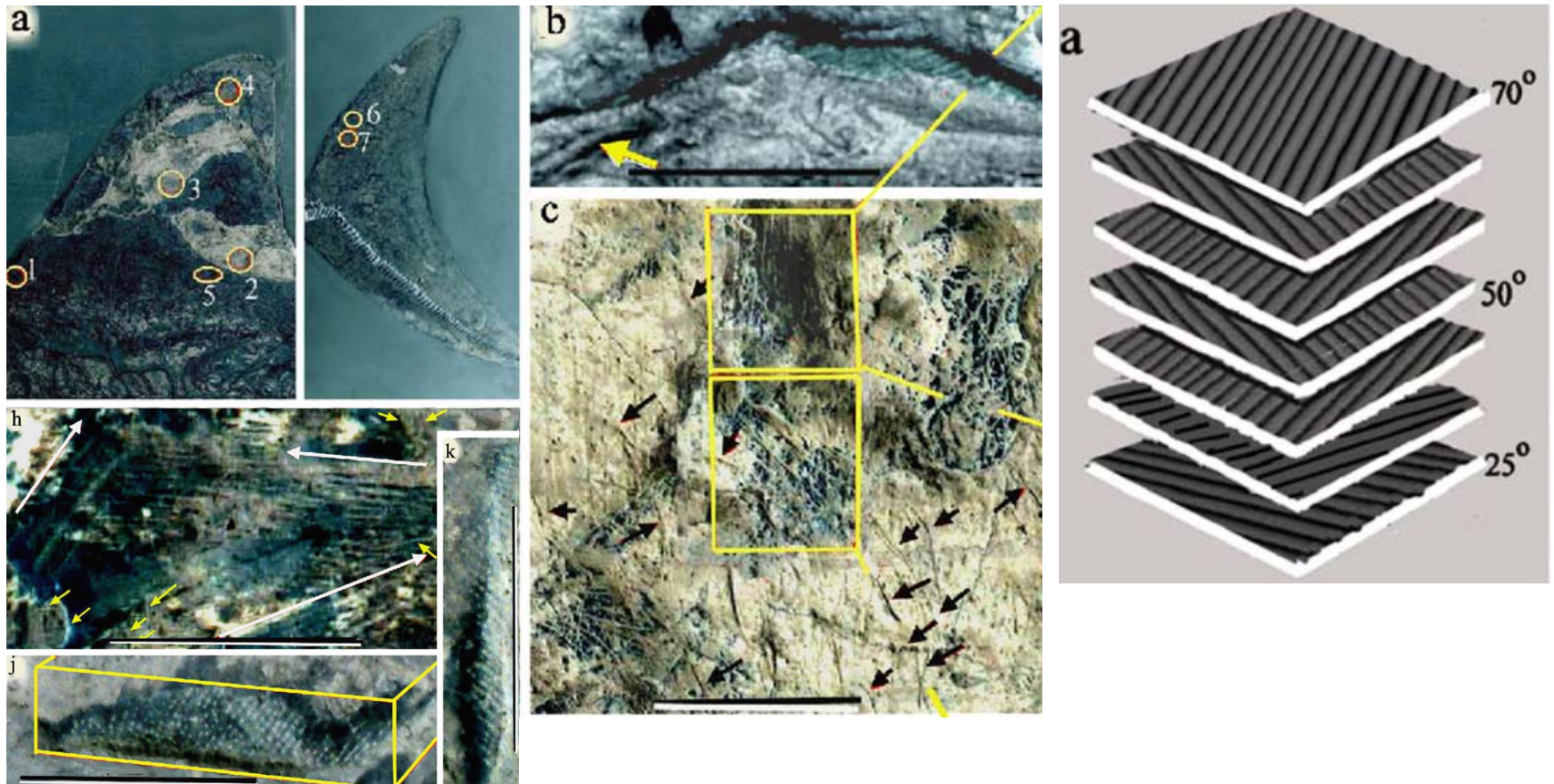
Vitesse de croisière
2-3x supérieure aux
autres reptiles
marins



Les super-pouvoirs des ichthyosaures: 2 – peau épaisse, lisse et solide

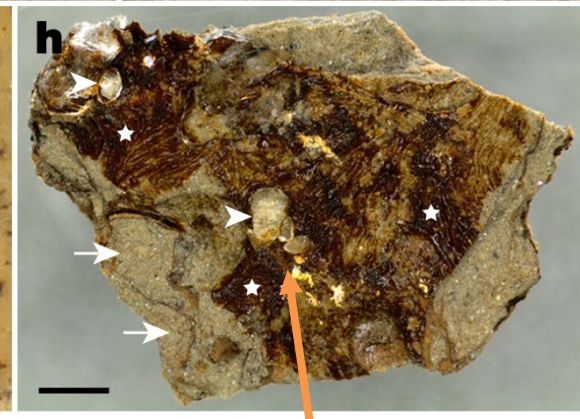
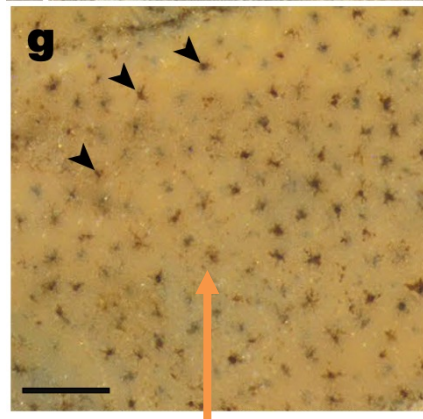
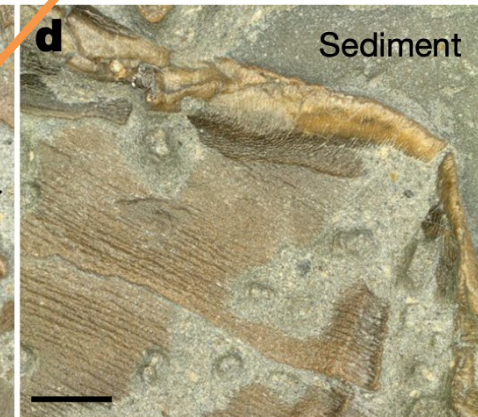
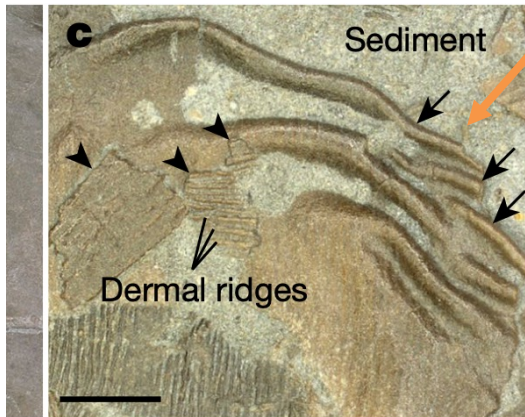
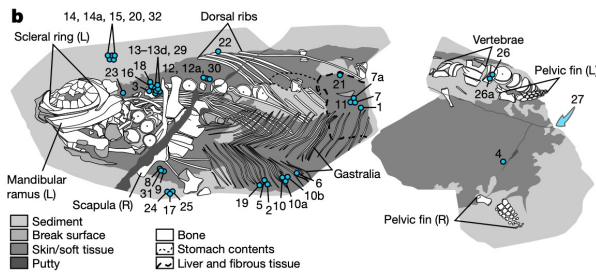
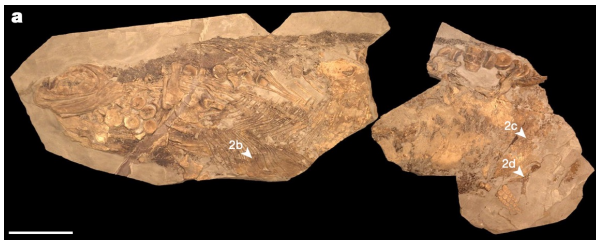


Les super-pouvoirs des ichthyosaures: 2 – peau épaisse, lisse et solide



Les super-pouvoirs des ichthyosaures: 2 – peau épaisse, lisse et solide

Peau lisse à l'extérieur

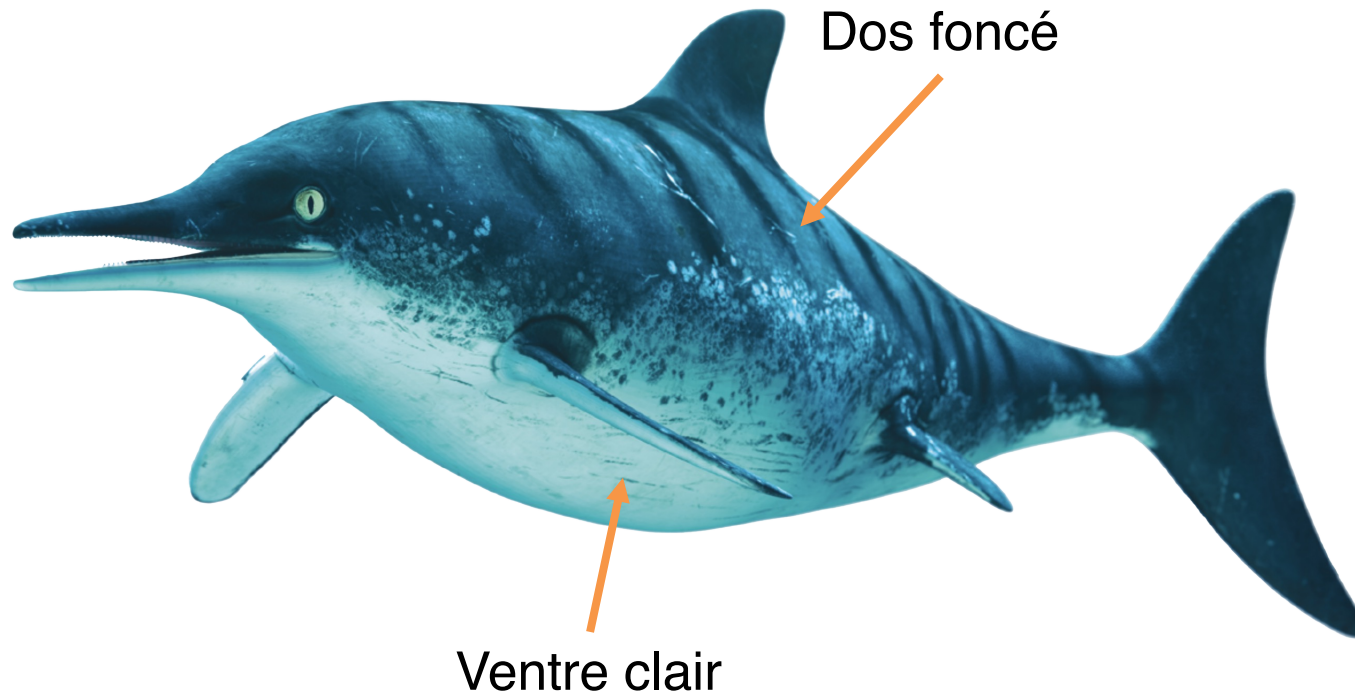


Lindgren et al 2018

Melanosomes

Couche de gras

Les super-pouvoirs des ichthyosaures: 2 – peau épaisse, lisse et solide

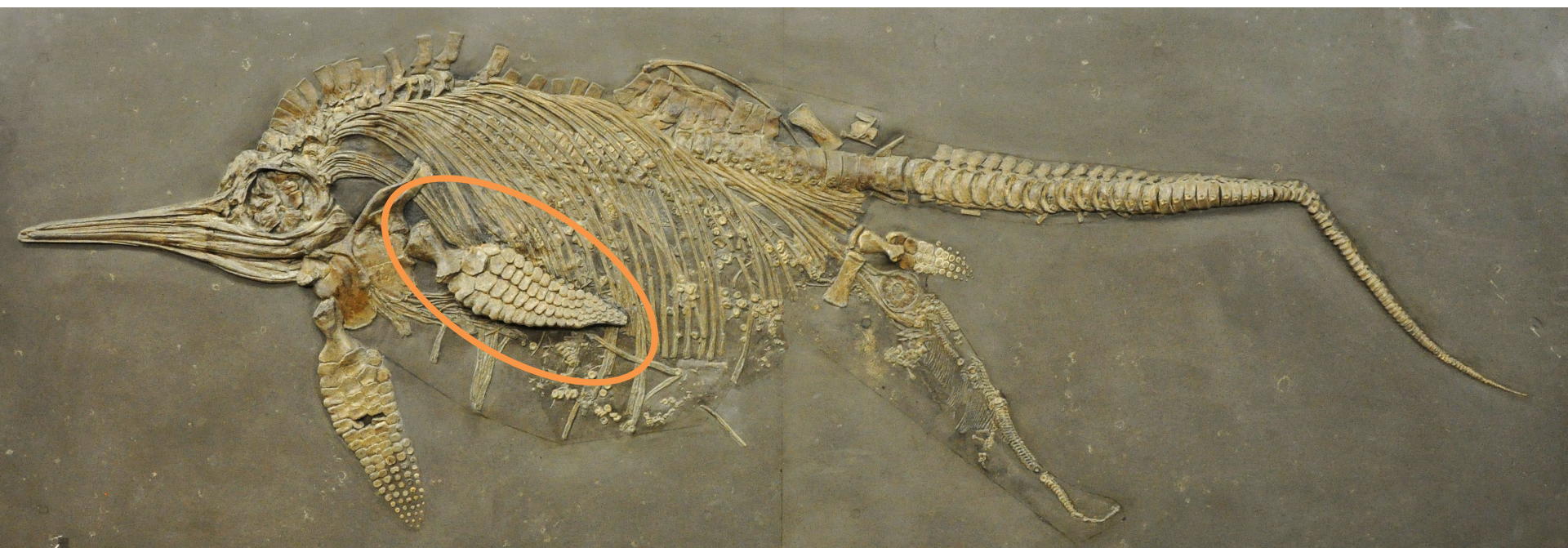




Nicki, Bottleneck Dolphin in Monkey Mia

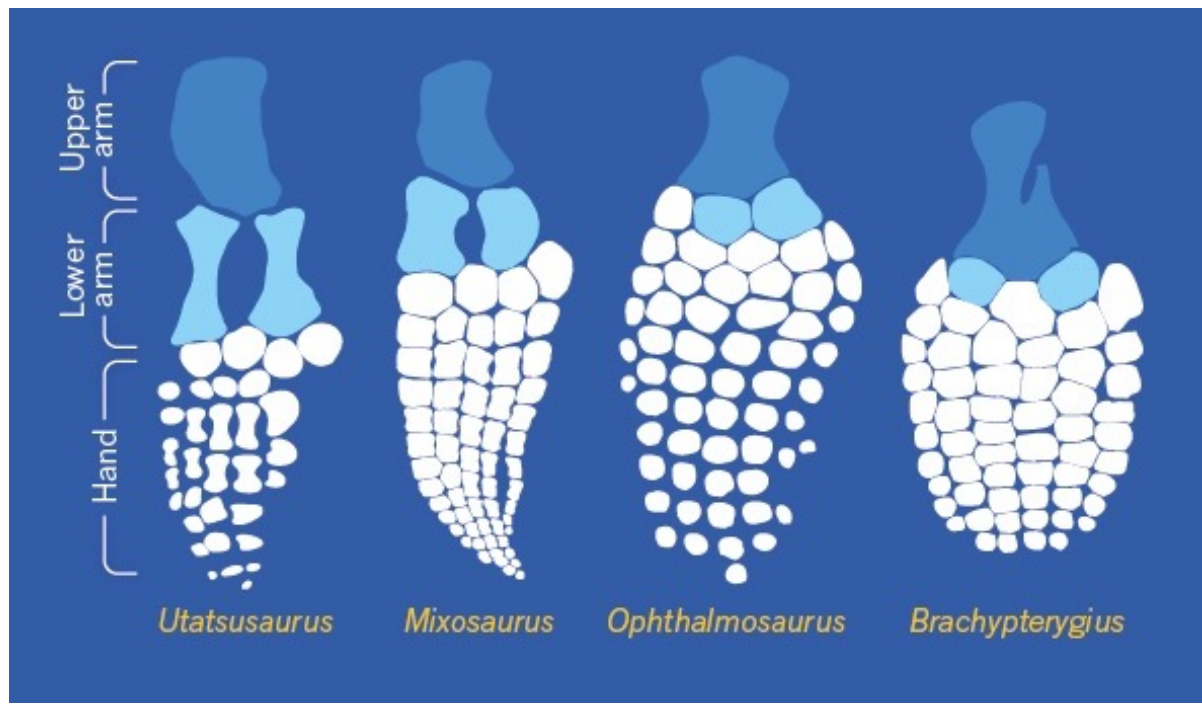
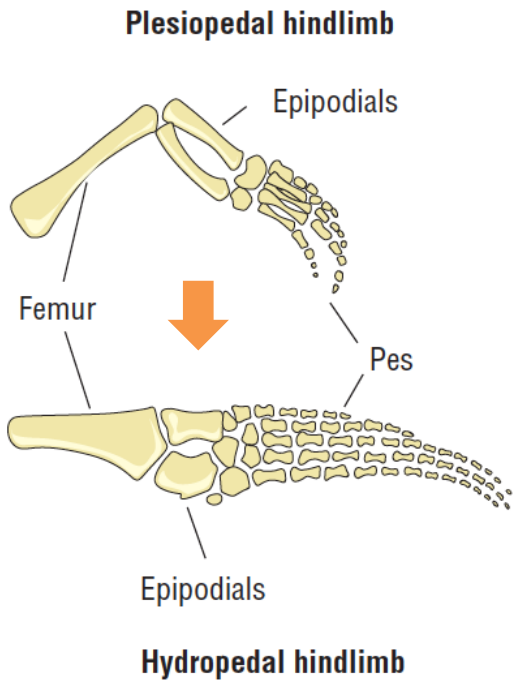
© Holterscan, Wikipedia

Les super-pouvoirs des ichthyosaures: 3 – des membres en forme de rames

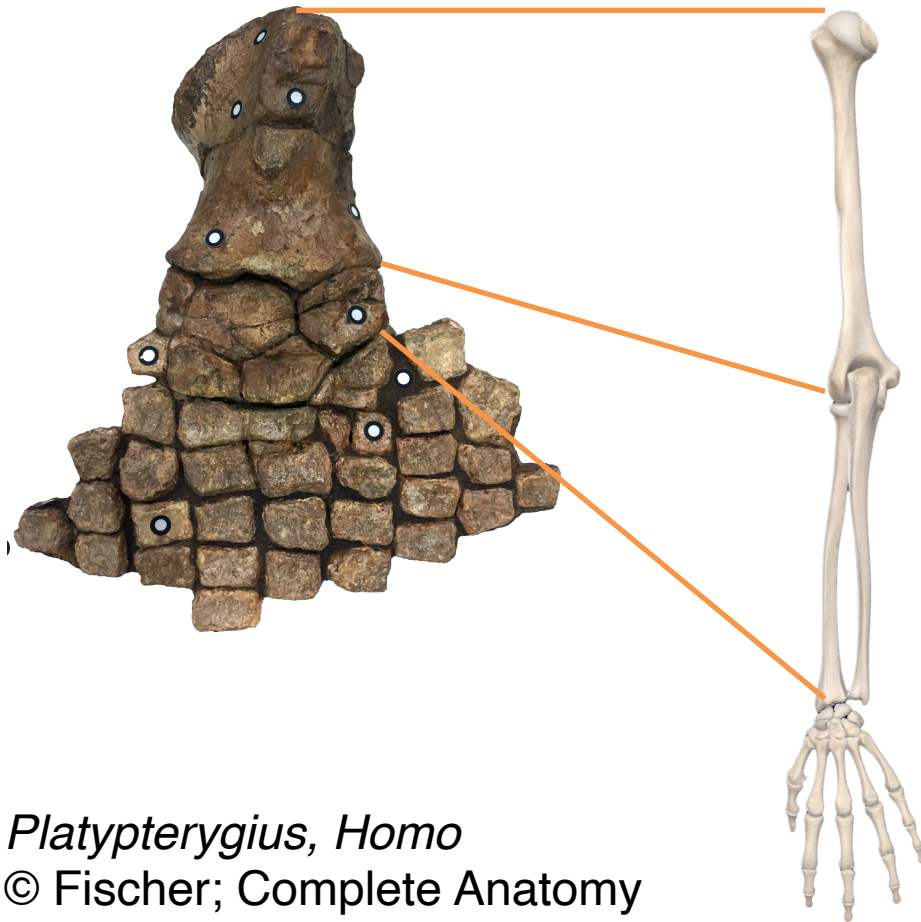


Stenopterygius
© S. Sachs; MNHNL

Les super-pouvoirs des ichthyosaures: 3 – des membres en forme de rames

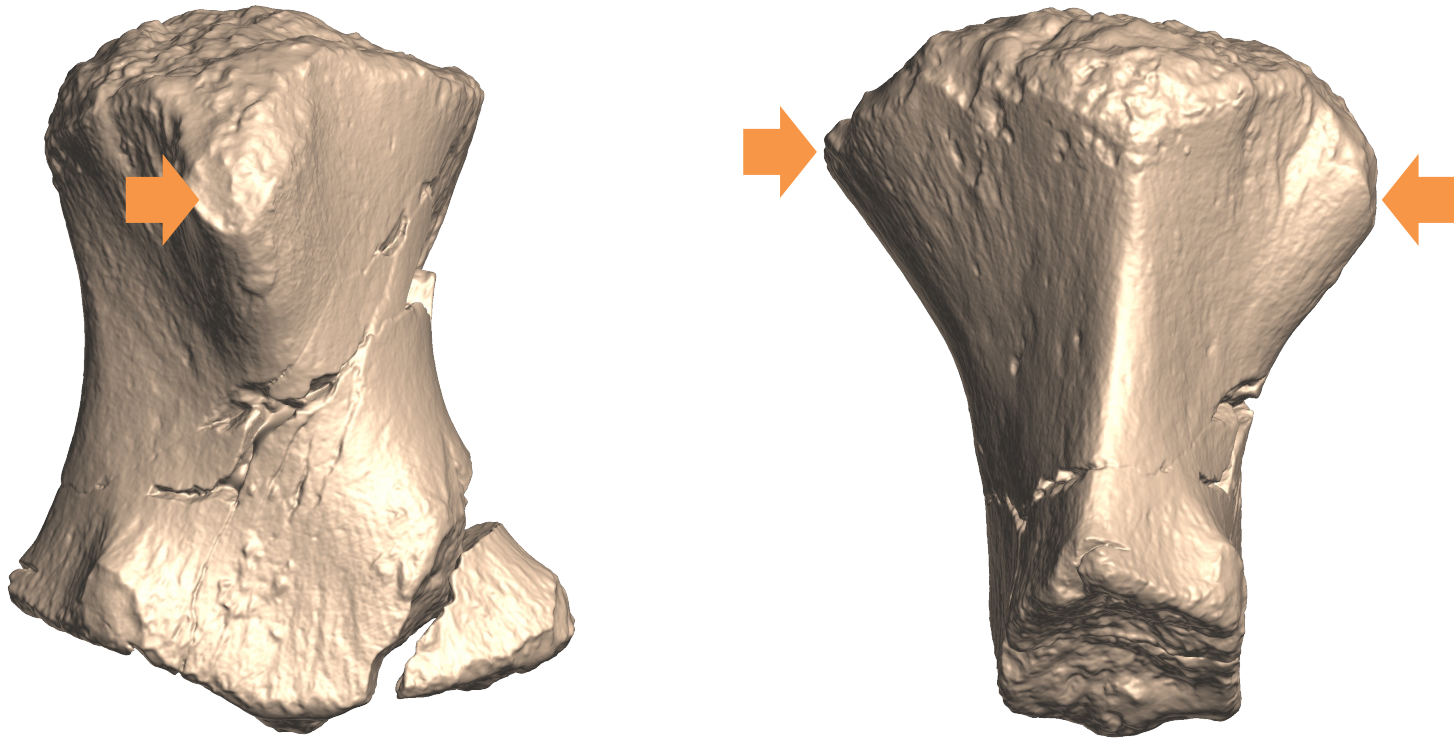


Les super-pouvoirs des ichthyosaures: 3 – des membres en forme de rames



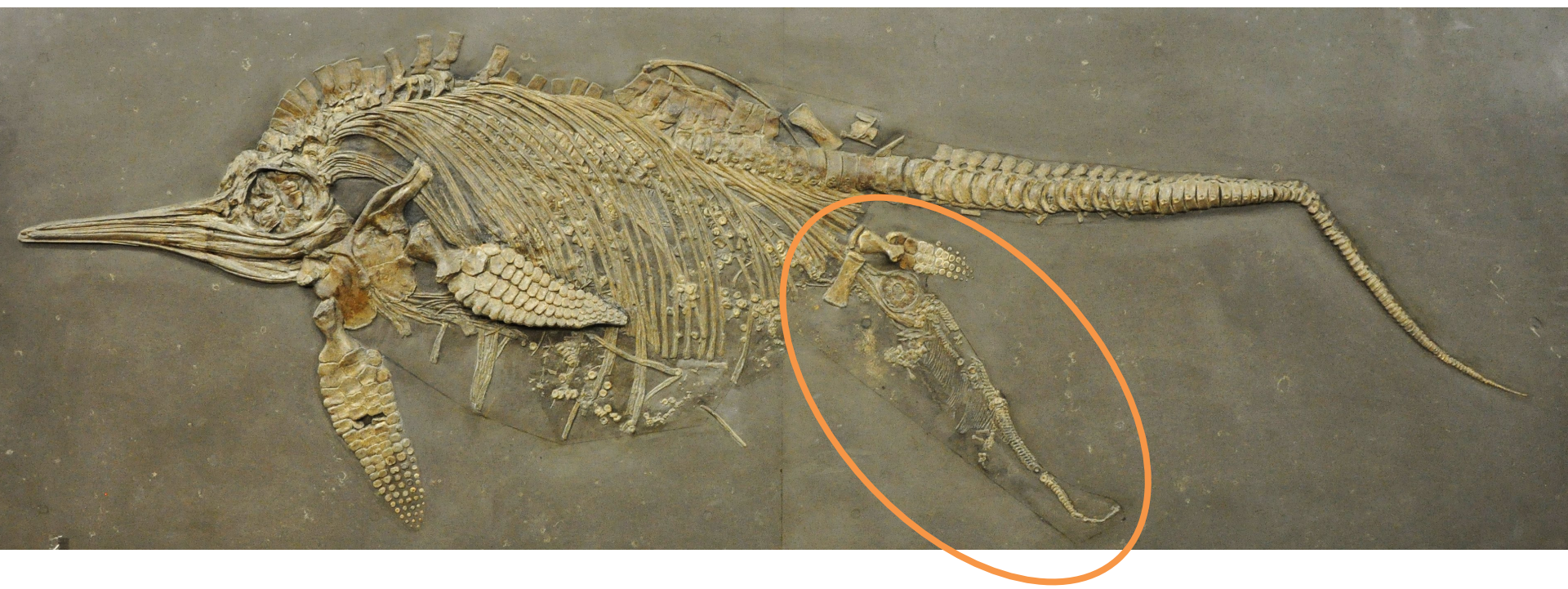
Platypterygius, Homo
© Fischer; Complete Anatomy

Les super-pouvoirs des ichthyosaures: 3 – des membres en forme de rames



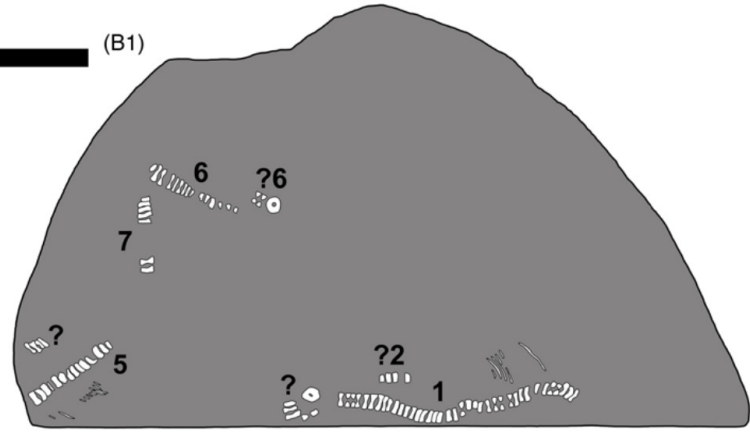
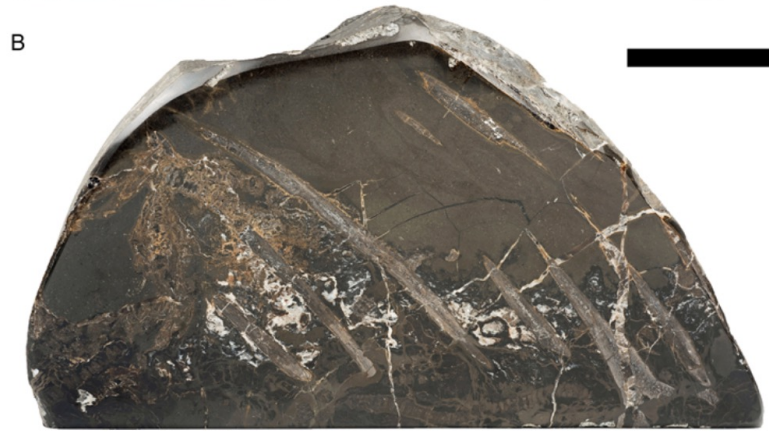
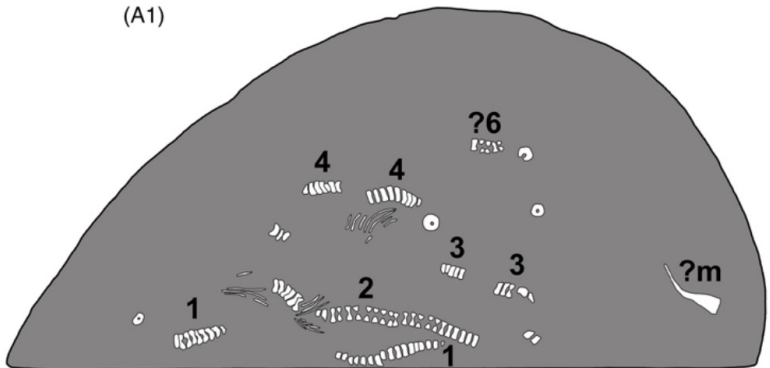
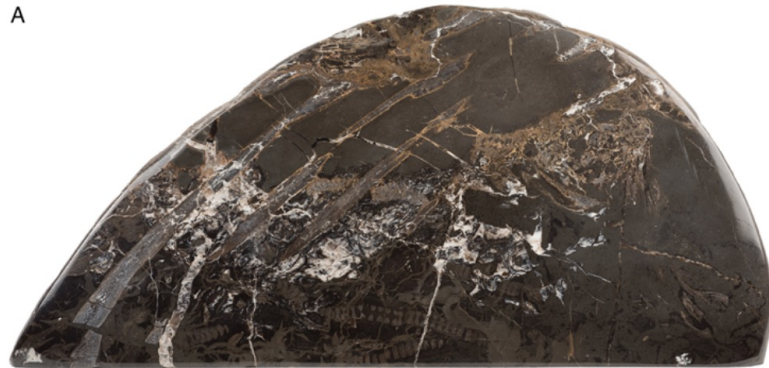
Ophthalmosauridae gen. et sp. nov. 💪💪💪
Fischer et al. in prep

Les super-pouvoirs des ichthyosaures: 4 – ovoviviparité ❌

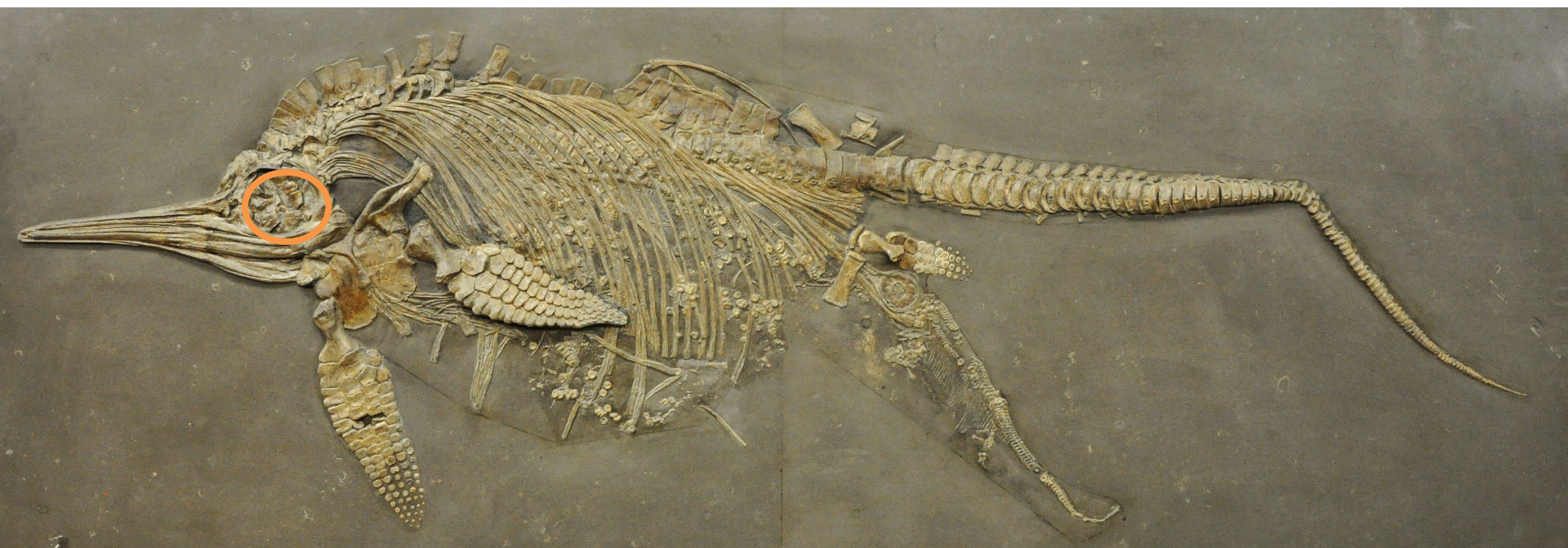


Stenopterygius
© S. Sachs; MNHNL

Les super-pouvoirs des ichthyosaures: 4 – ovoviviparité ✕, jusqu'à 8 embryons



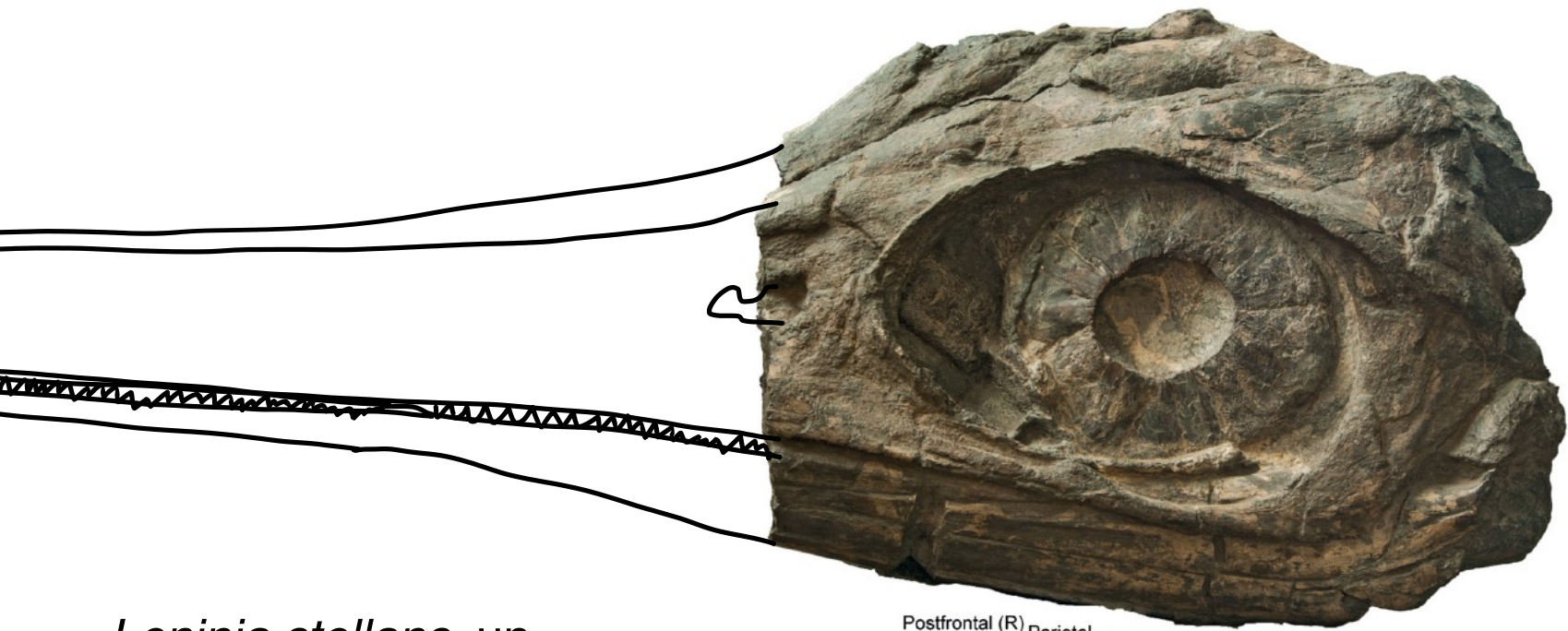
Les super-pouvoirs des ichthyosaures: 5 – les grands yeux jamais évolués



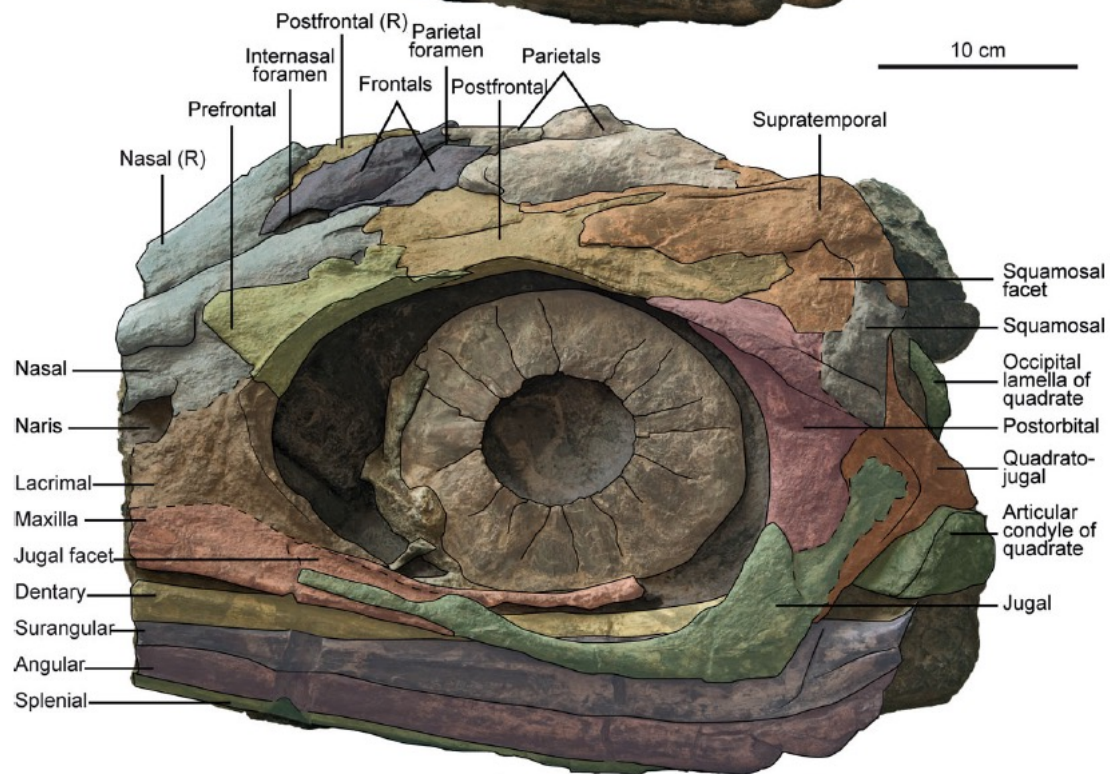
Stenopterygius
© S. Sachs; MNHNL

Les super-pouvoirs des ichthyosaures: 5 – les plus grands yeux jamais évolués





Leninia stellans, un ichthyosaure du Crétacé de Russie



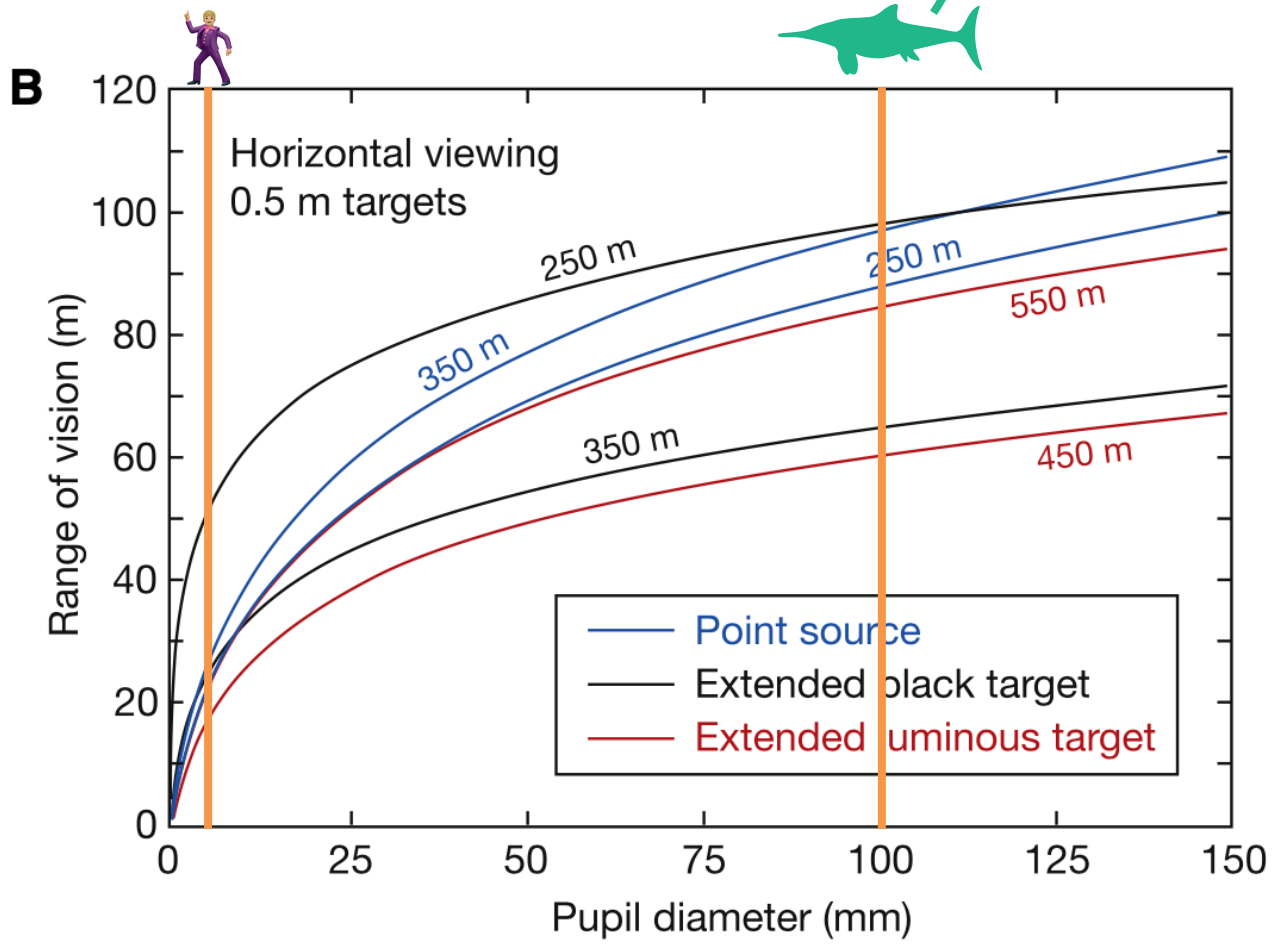
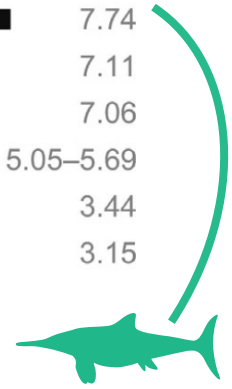


Œil humain

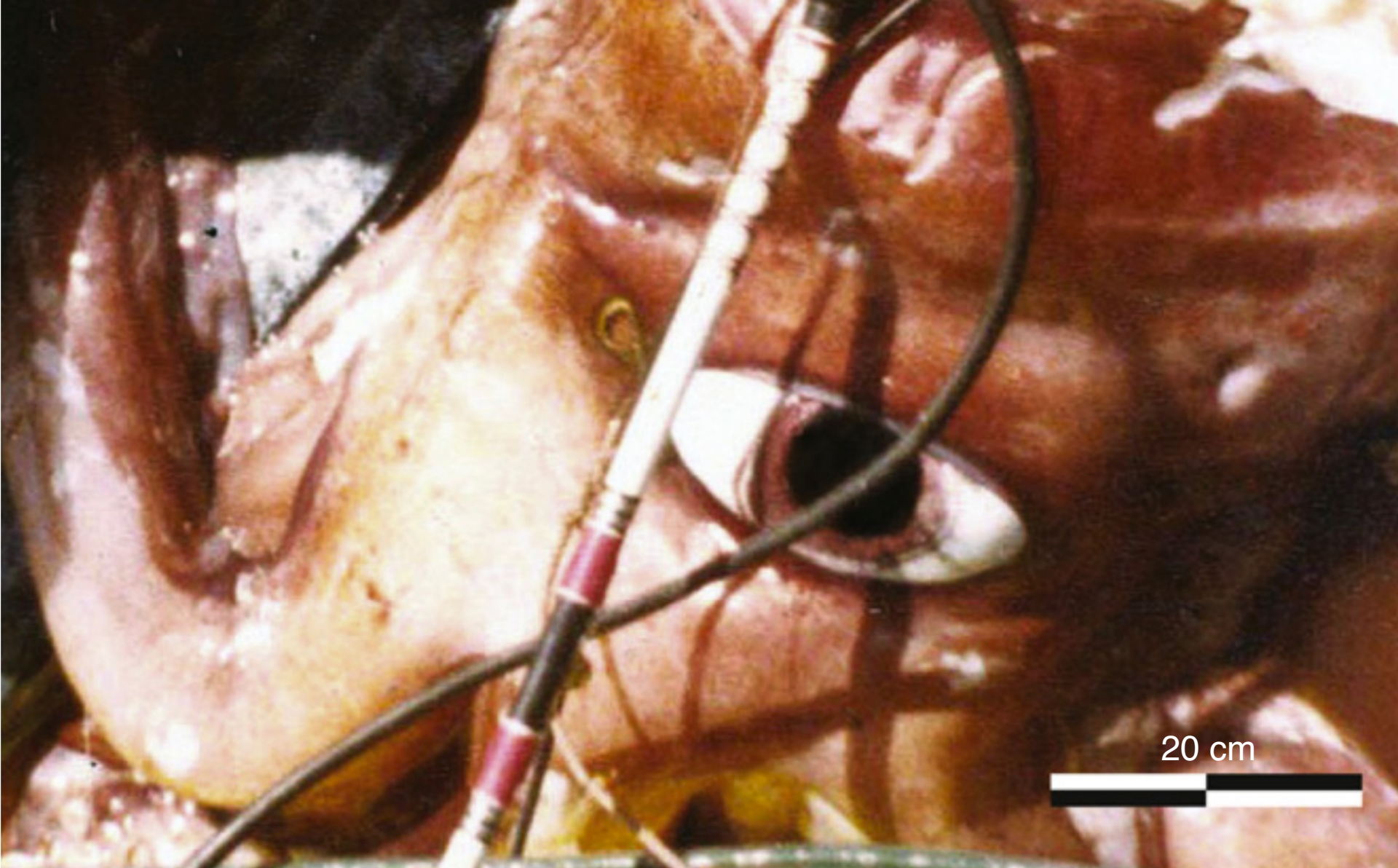
Œil Ophthalmosaurus



Taxon	Sclerotic aperture (cm)
<i>Ophthalmosaurus natans</i>	≥ 10
<i>Leninia stellans</i>	7.74
<i>Ophthalmosaurus icenicus</i>	7.11
<i>Mollesaurus perialus</i>	7.06
<i>Caypullisaurus bonapartei</i>	5.05–5.69
<i>Sveltonectes insolitus</i>	3.44
<i>Platypterygius australis</i>	3.15



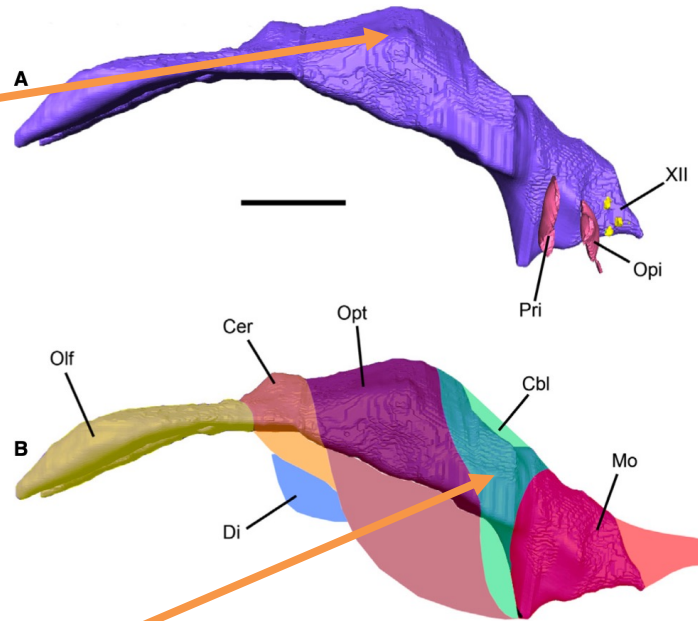
Nilsson et al 2012;
Fischer et al 2014



Architeuthis
Nilsson et al 2012

Les super-pouvoirs des ichthyosaures: 6 – un cerveau spécialisé

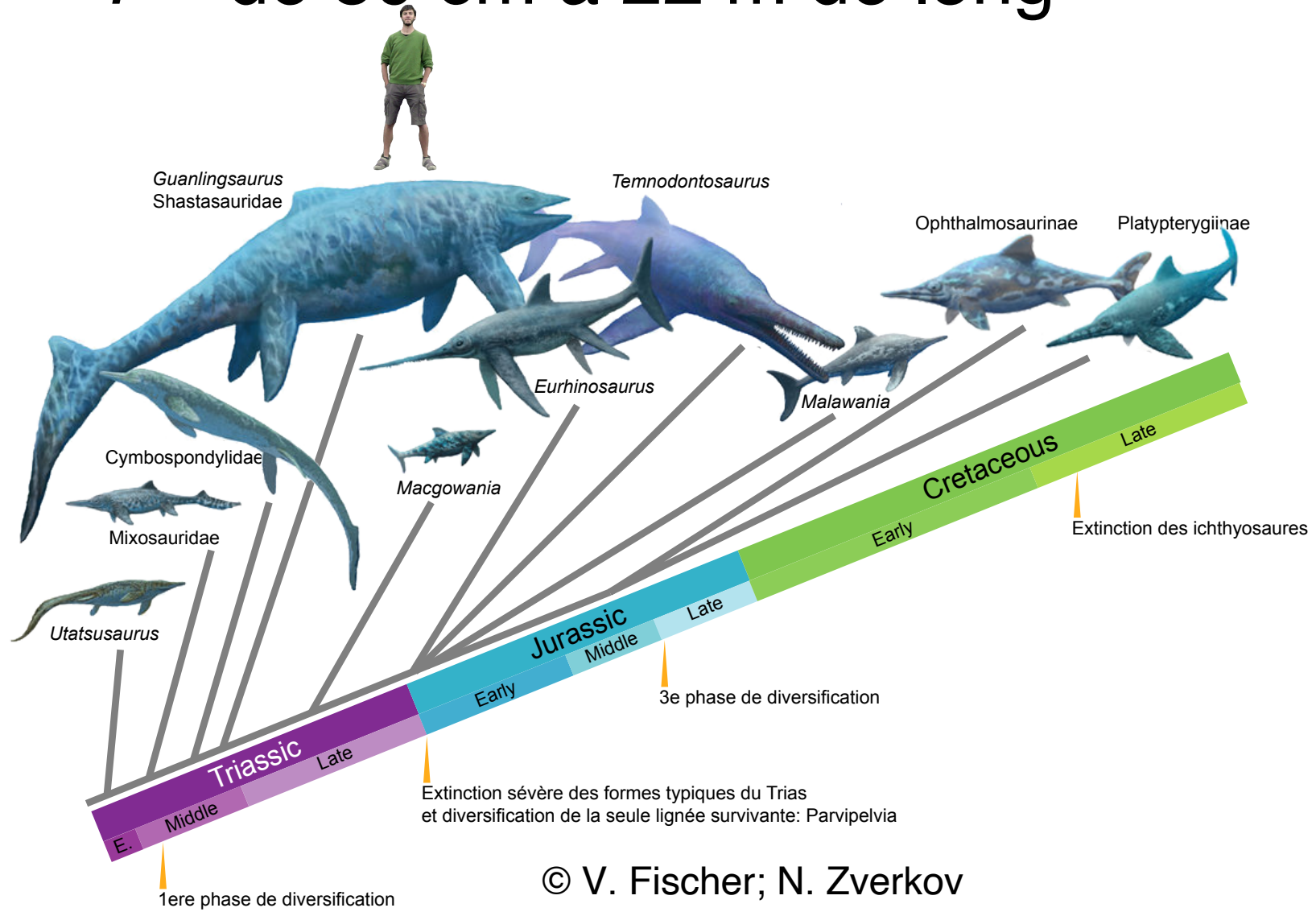
Lobe optique:
énorme
→ Vision 



Cerebellum: élargi
→ Manœuvrabilité

Hauffiopteryx
Marek et al 2015

Les super-pouvoirs des ichthyosaures: 7 – de 50 cm à 22 m de long



Les super-pouvoirs des ichthyosaures: 7 – de 50 cm à 22 m de long



© S. Giner; Royal Tyrrell
Museum

*Shonisaurus
sikanniensis*

Comment reconstituer l'anatomie et mode de vie des reptiles marins ? 🤔

Indices anatomiques 🦴
et physiques 👁️

- 3D et statistiques 🧑💻

Des scanners portables pour créer des modèles ultra-précis ($\ll 1\text{mm}$)

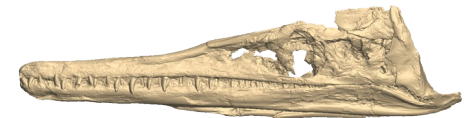
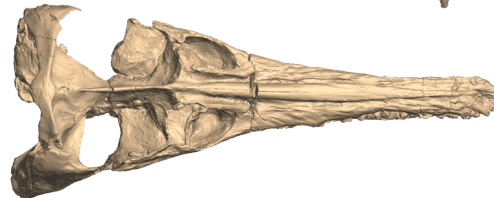
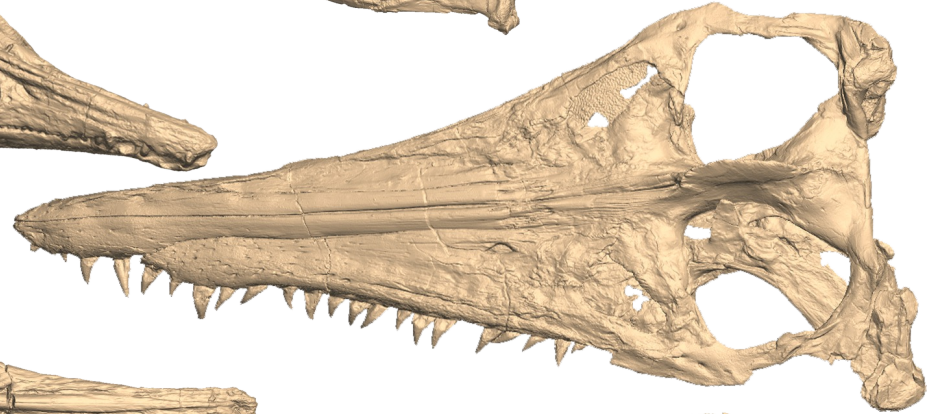
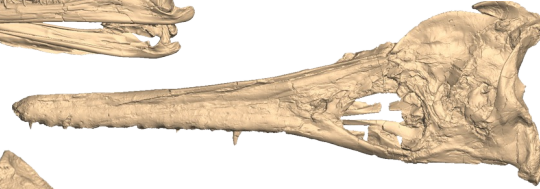
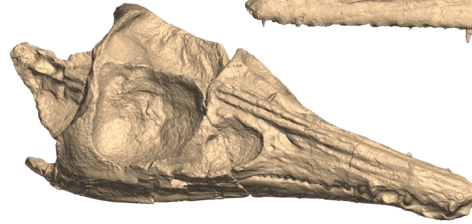
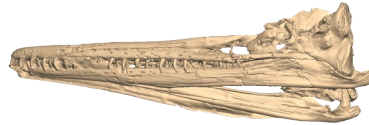
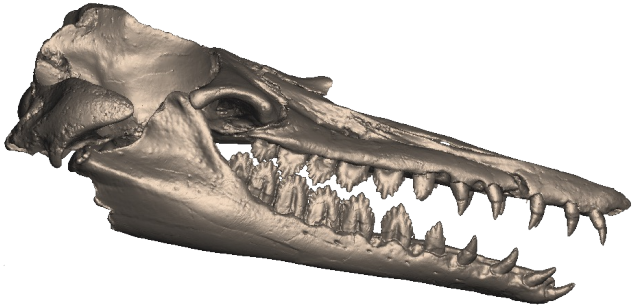
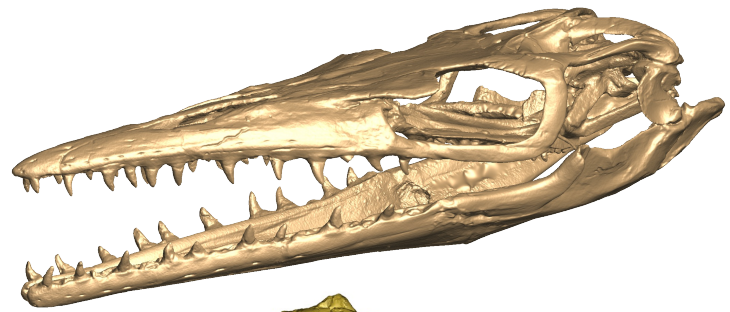
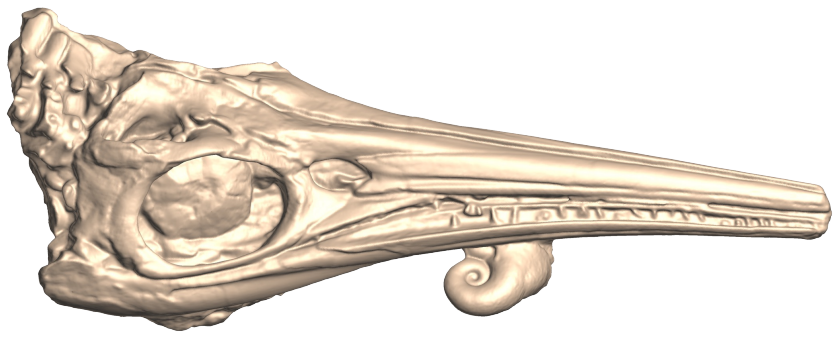


R.F. Bennion &
Temnodontosaurus

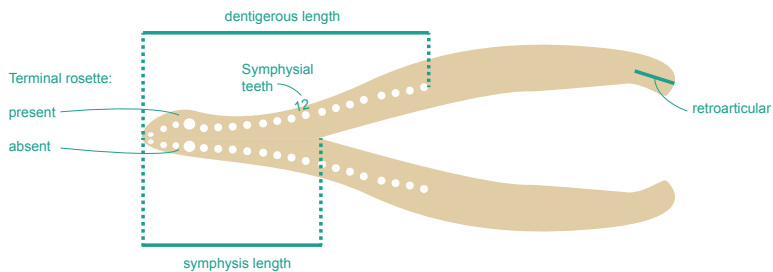
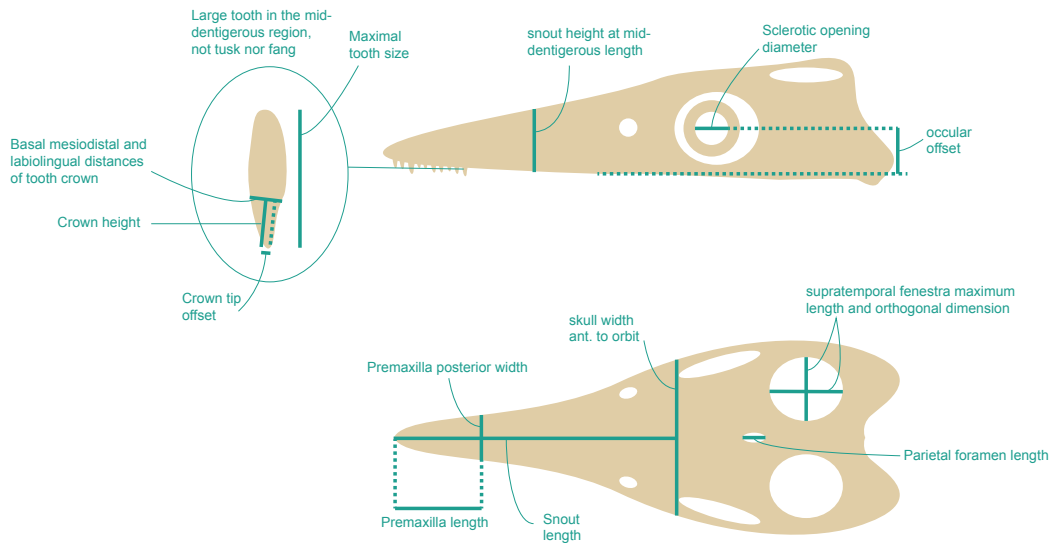
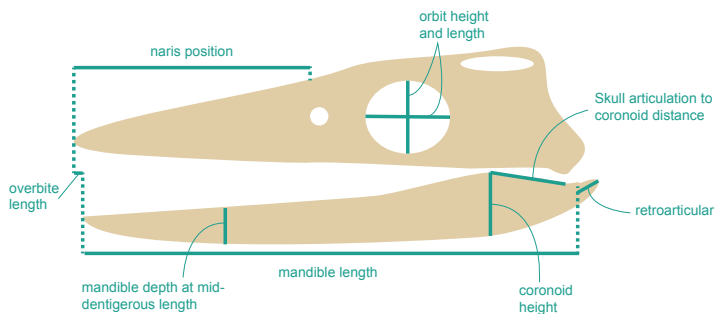


Dr. J.A. MacLaren & *Tylosaurus bernardi*

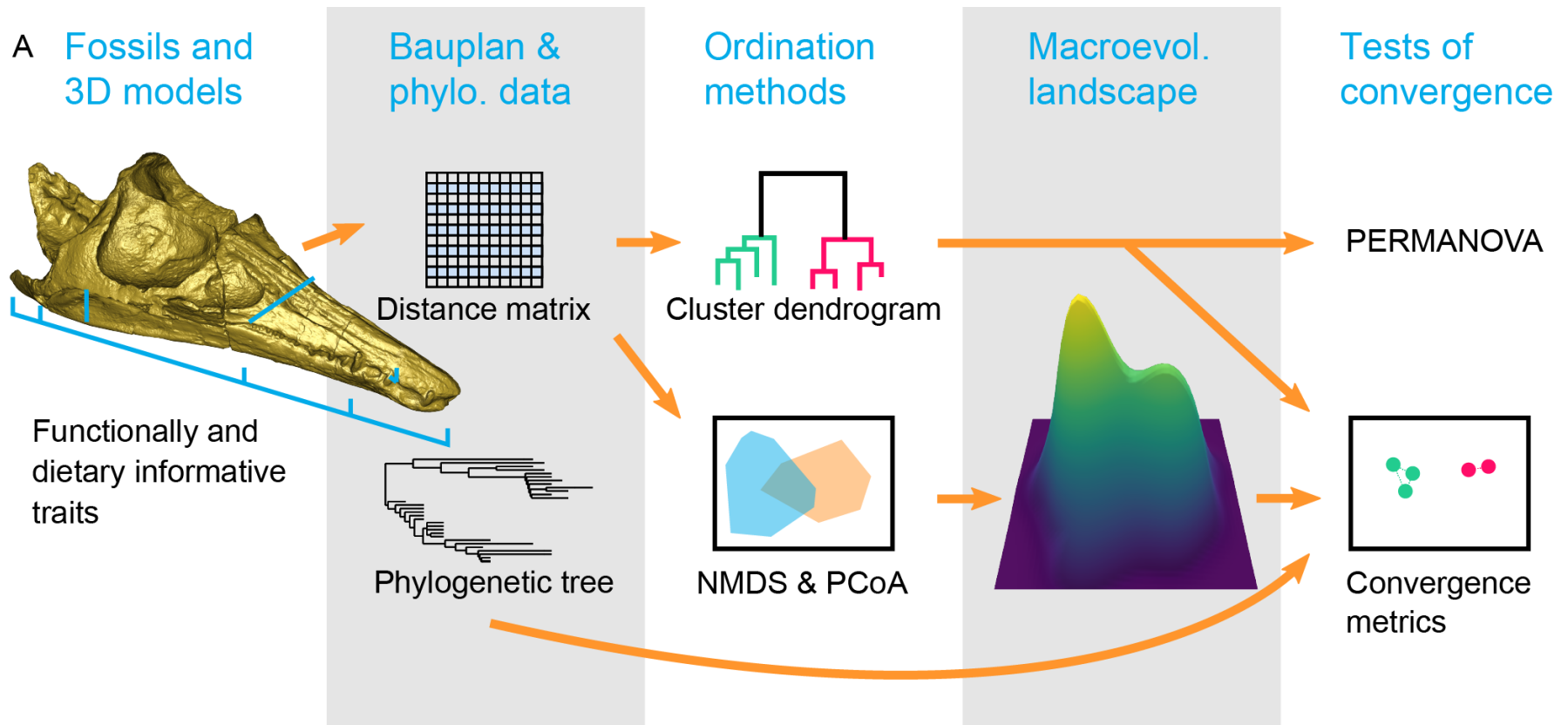




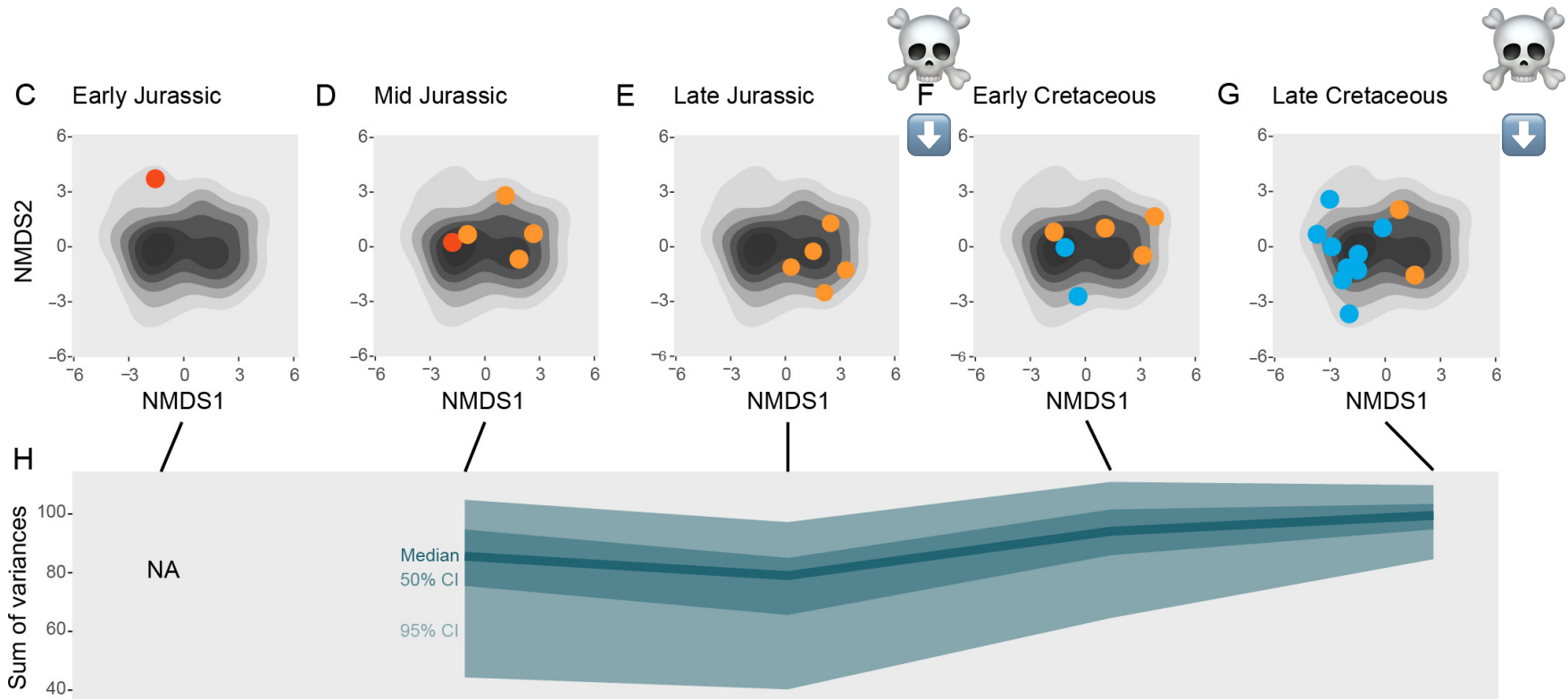
© Bennion, Fischer,
MacLaren, EDDyLab
Fischer et al 2020



Comprendre les modalités de l'évolution des reptiles marins



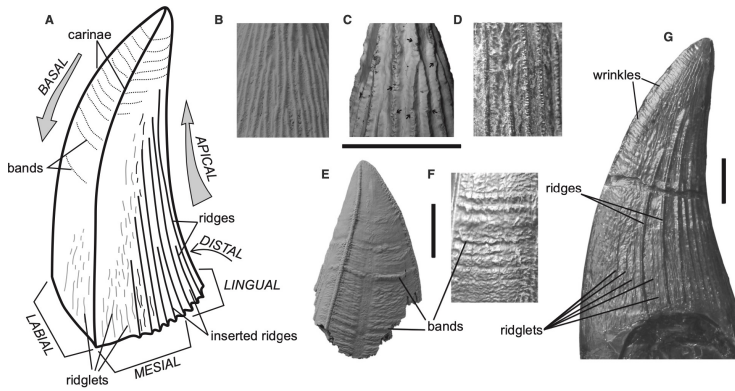
Comprendre les modalités de l'évolution des reptiles marins



Fischer et al 2020
Art © A. Atuchin

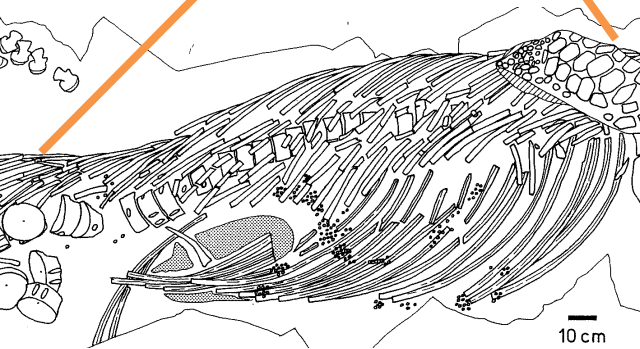


Reconstituer le régime alimentaire des reptiles marins

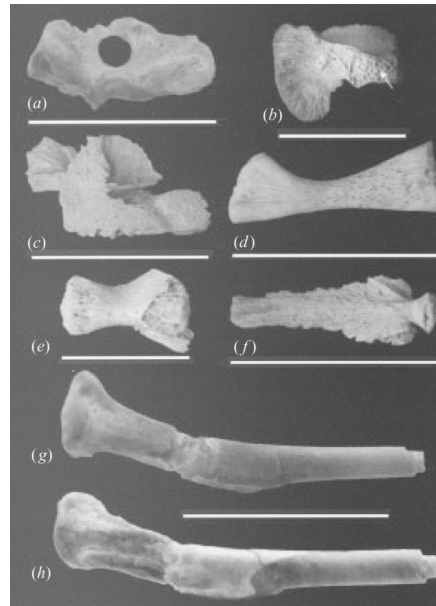


© Triebolt
Paleontology;
Fischer; Bennion;
Zverkov et al 2018
Palaeontology

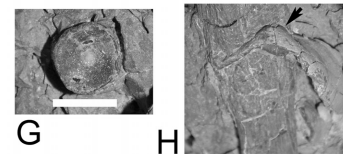
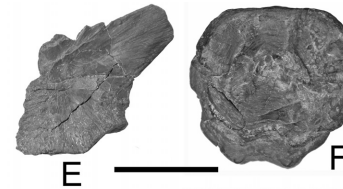
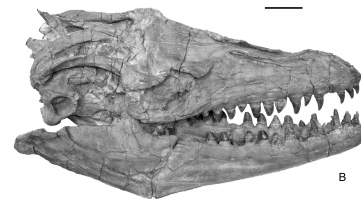
Reconstituer le régime alimentaire des reptiles marins



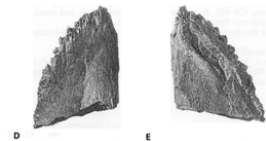
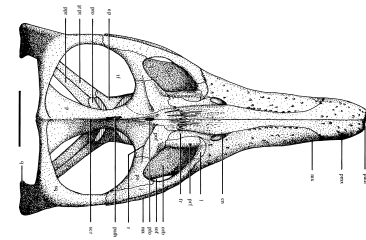
Böttcher 1989



Kear et al 2003

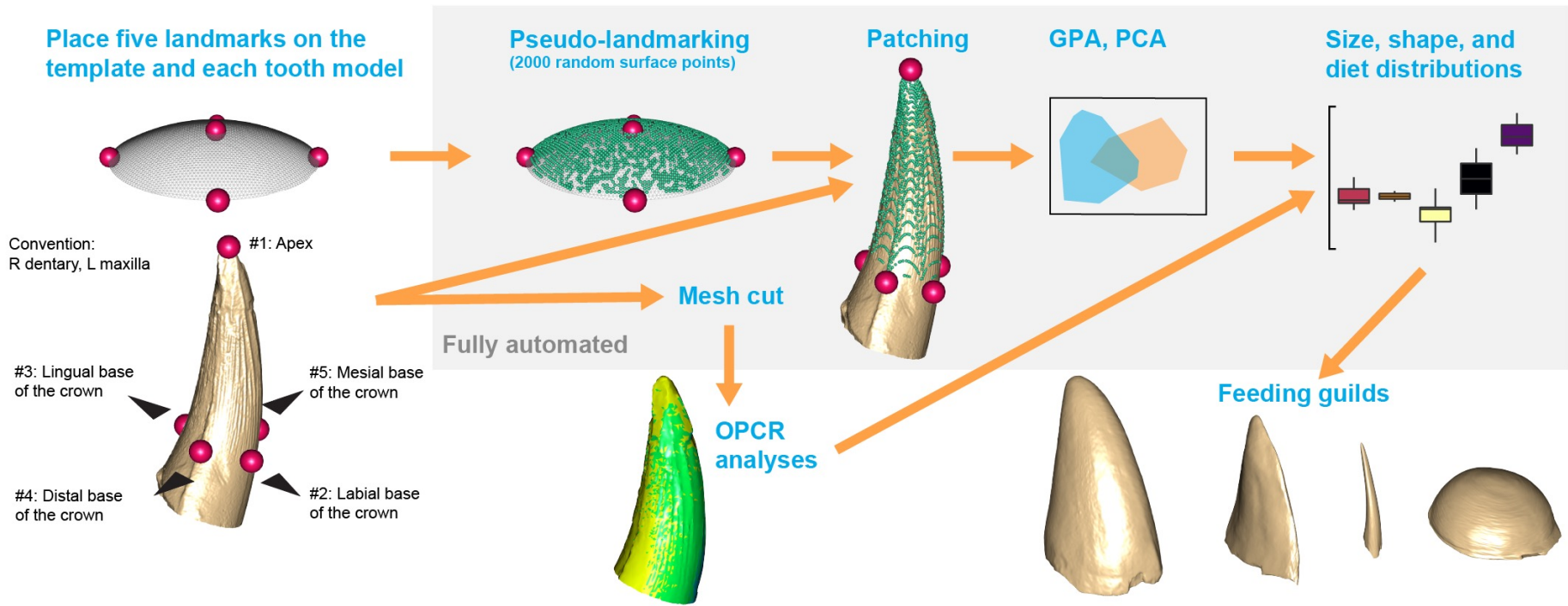


Konishi et al 2011

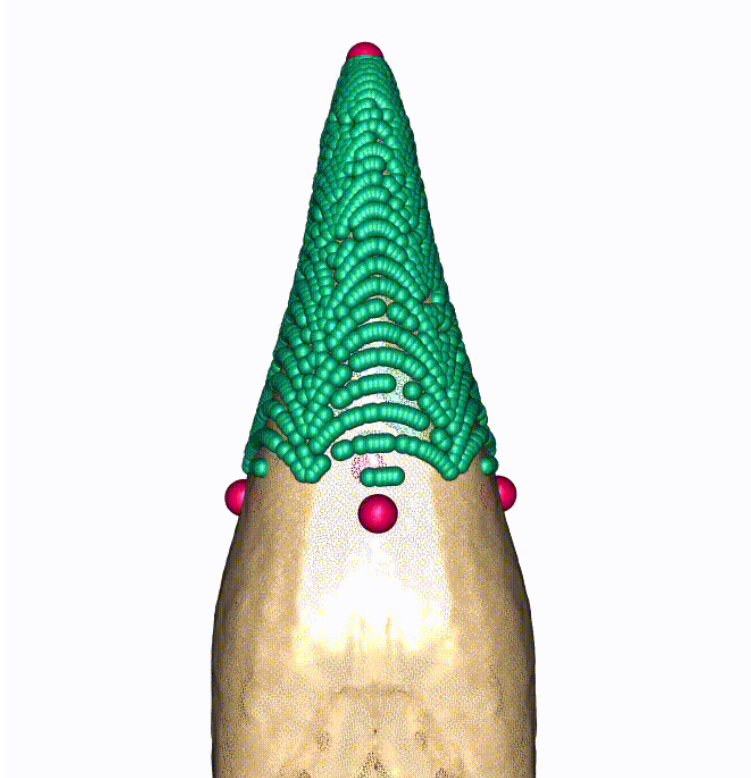


Taylor et al 1993

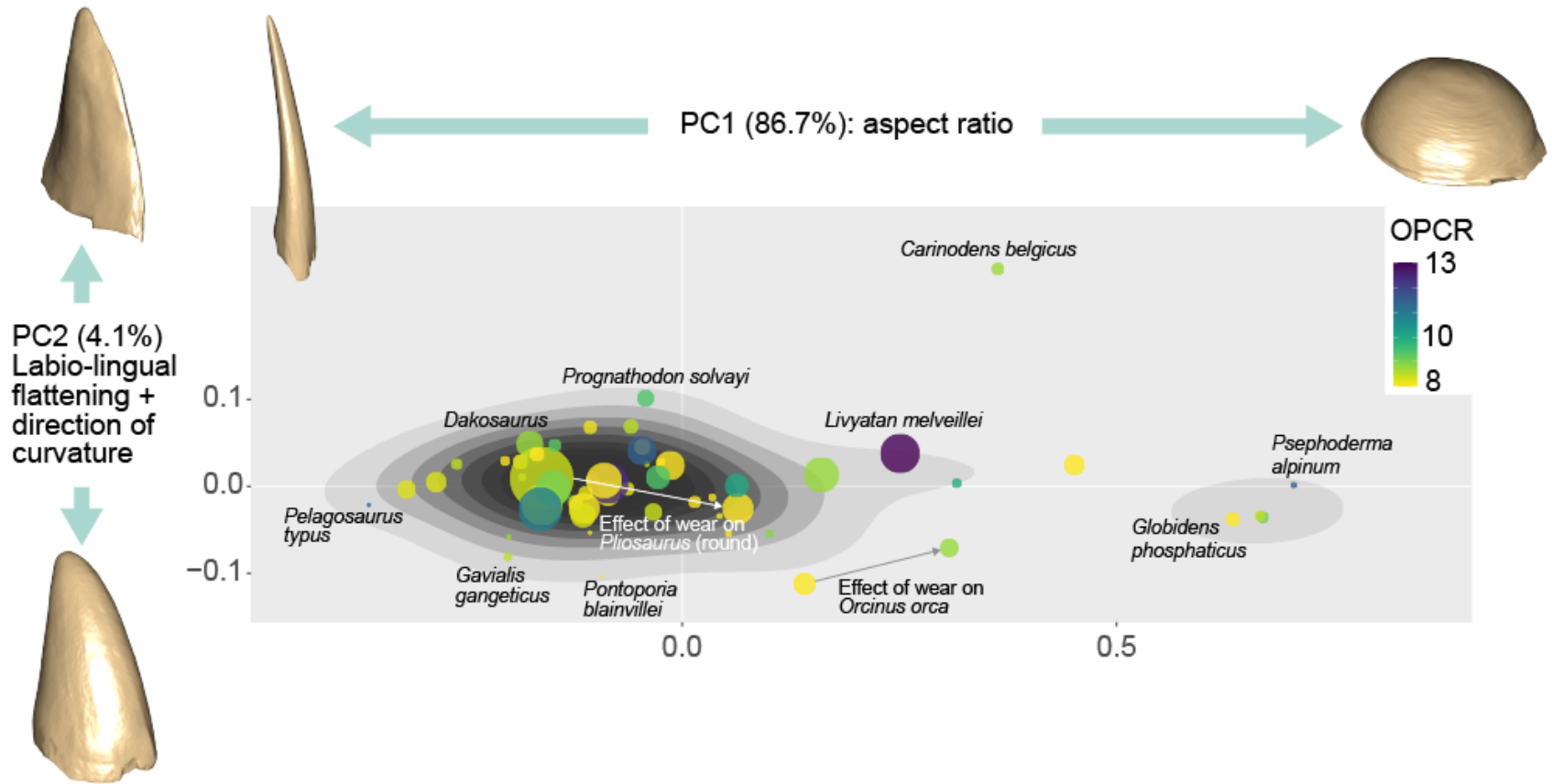
Reconstituer le régime alimentaire des reptiles marins



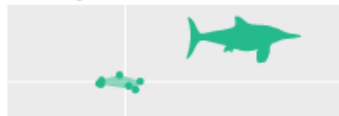
Reconstituer le régime alimentaire des reptiles marins



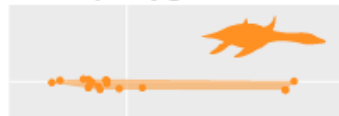
Fischer et al in prep.



Ichthyosauria



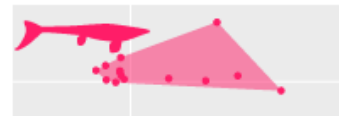
Sauropterygia



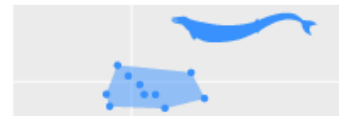
Archosauromorpha



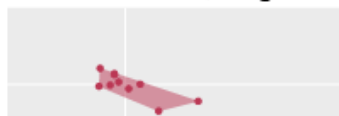
Mosasauroidea



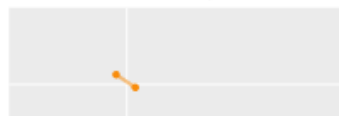
Cetacea



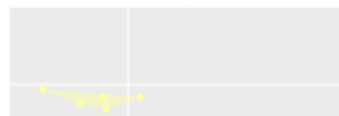
Gastric: Flesh, large



Gastric: Flesh, medium



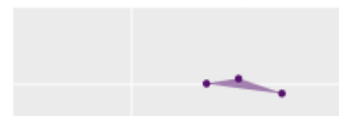
Gastric: Soft, small



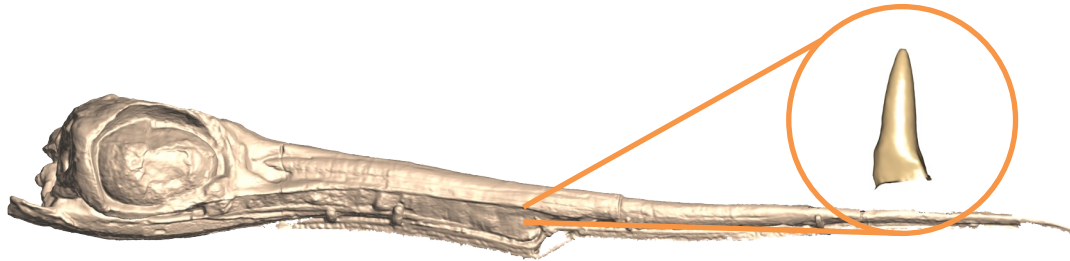
Gastric: Shelled, large



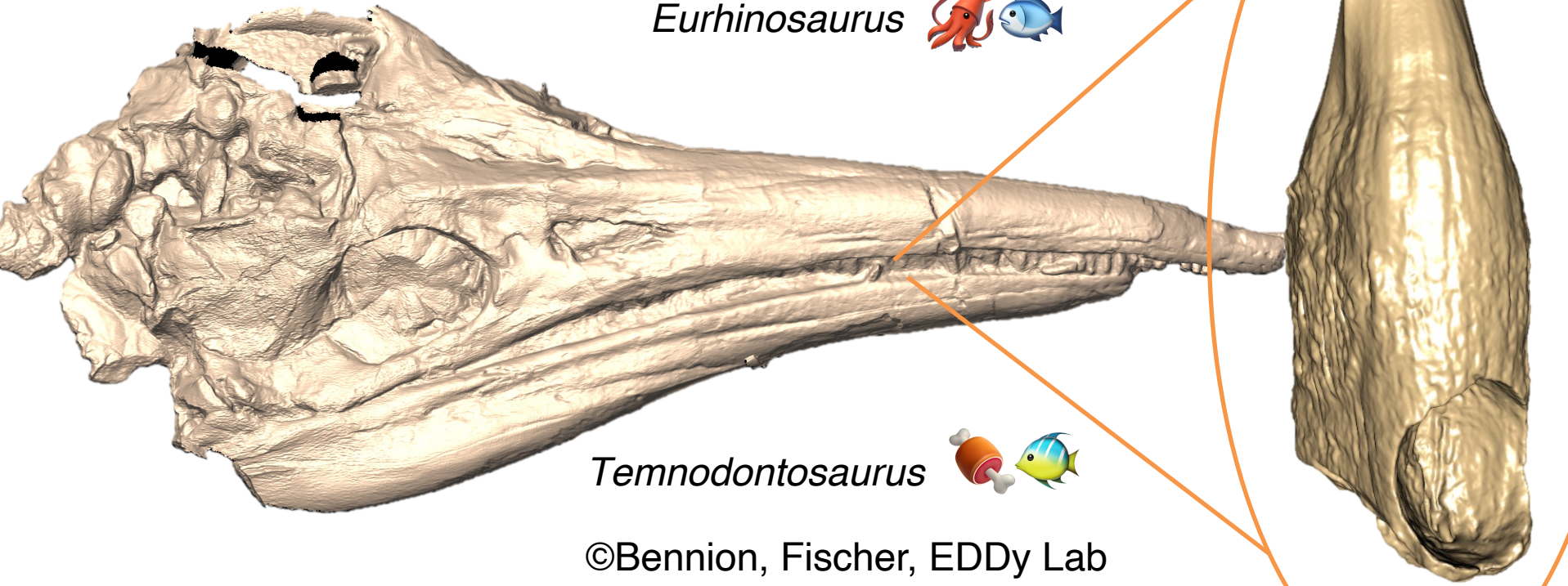
Gastric: Shelled, small



Reconstituer le régime alimentaire des reptiles marins



Eurhinosaurus 🐙🐟



Temnodontosaurus 🐠🐟



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