Trial & Error, Value and Science

オーストラリアにおける養殖技術研究を通じて得られたもの

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SCYLLA

Contents

Attention

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Key Words

Trial & Error

Science

Value

Life

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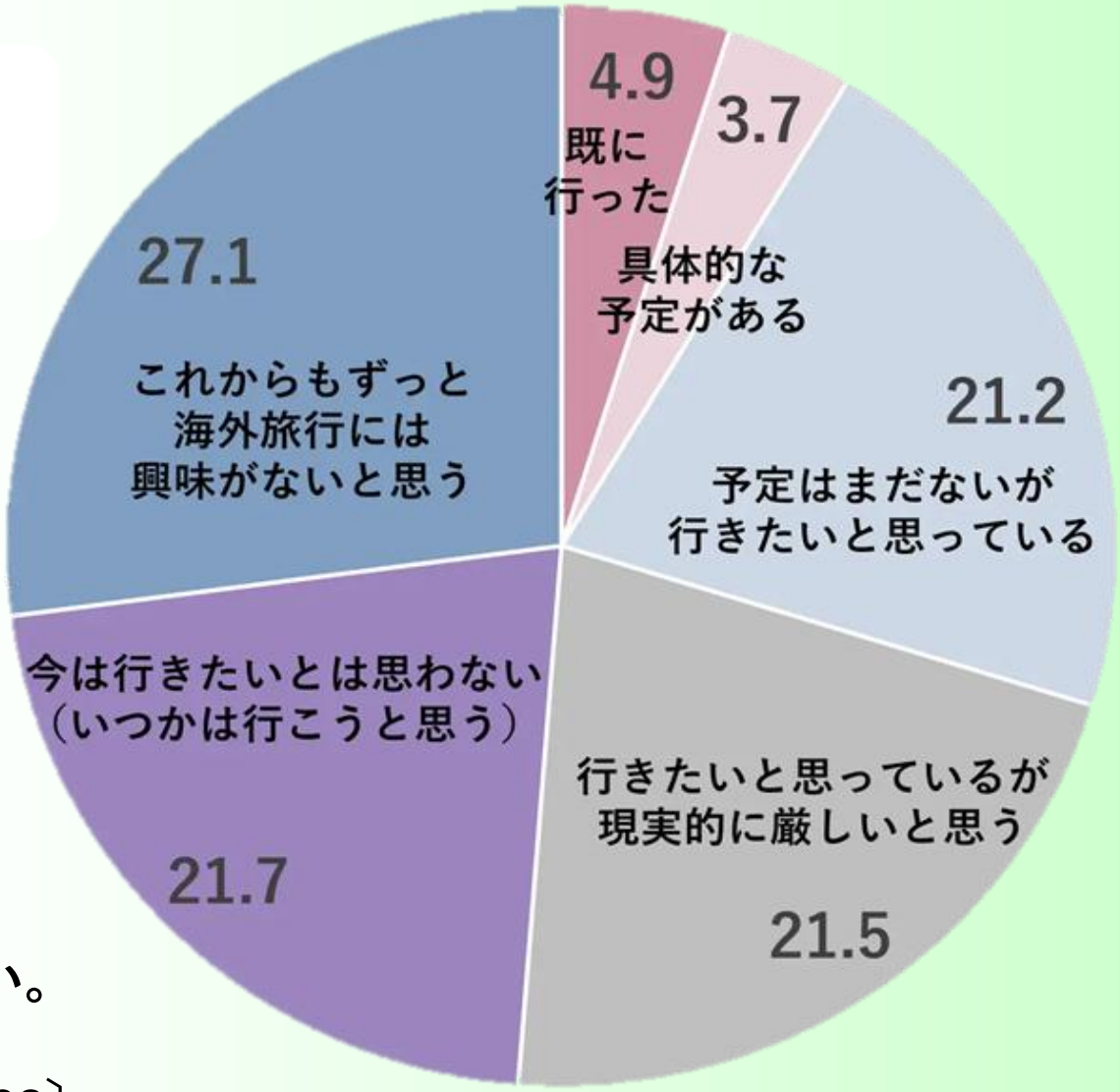
(Google Algorism)

Z世代の海外に関する意識調査

海外旅行に行く予定がある若者は10％以下！ 半数以上の若者は海外留学の意向なし!
コロナ禍明け、Z世代の海外渡航に対するハードルとは？



Q.コロナ禍以降の海外旅行について、
あなたにあてはまるものを教えてください。
[単一回答] n= 410 男性: 203 /女性:207
高校生:202 /大学生・短大・専門学校生:208〕

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SHIBUYA109 lab.／https://shibuya109lab.jp

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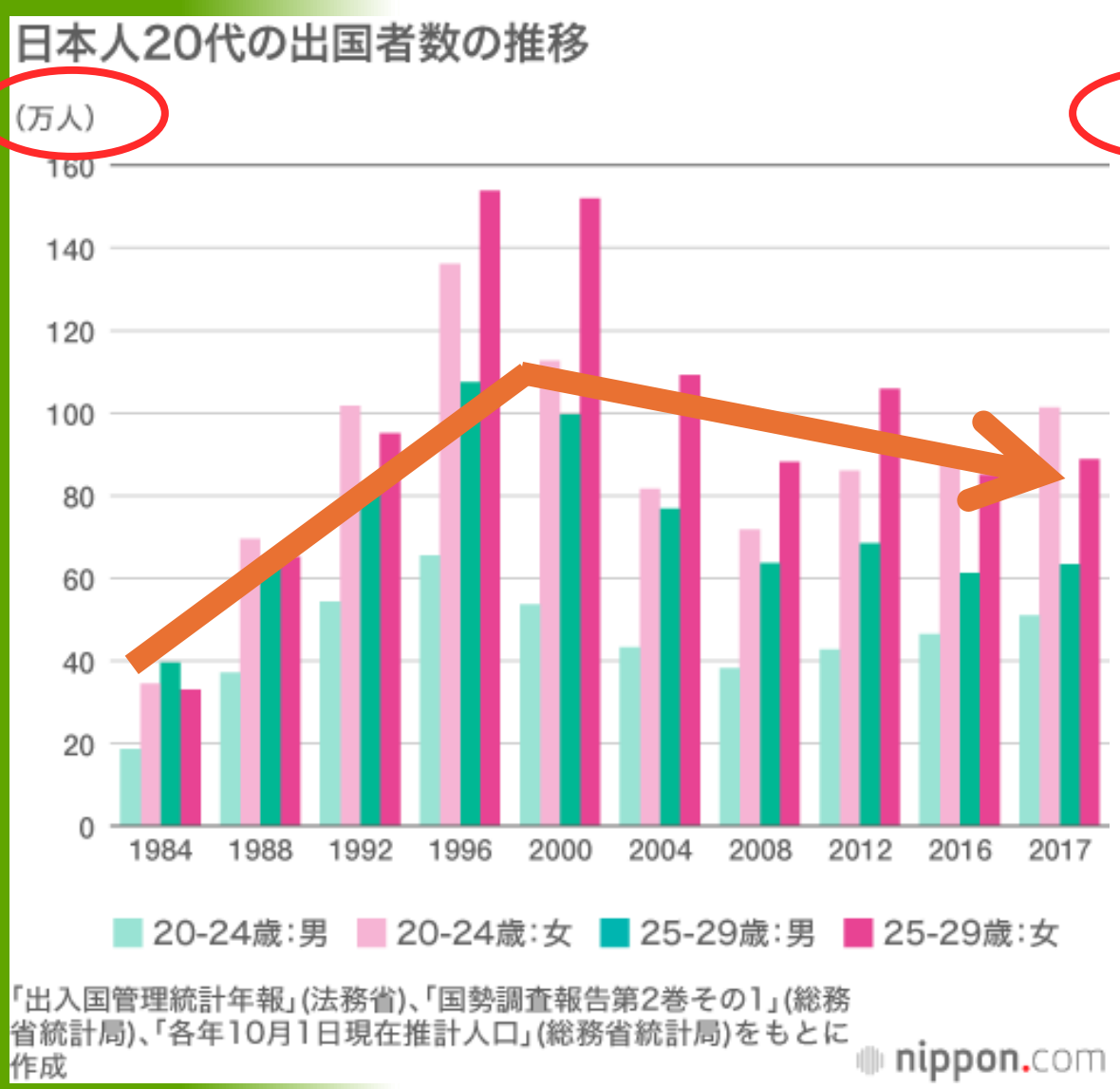

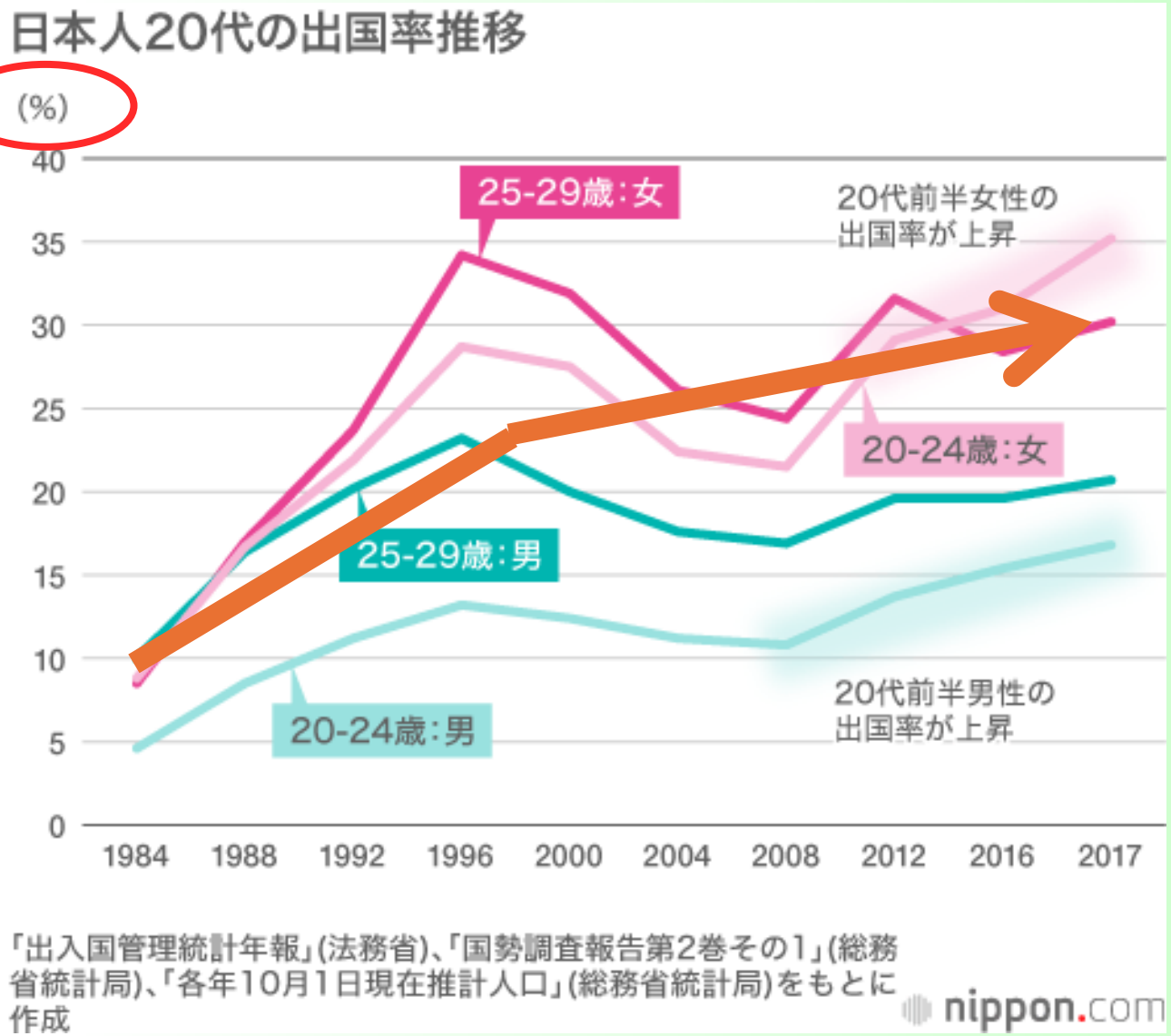

日本の若者の海外旅行はどう変わったのか
https://www.nippon.com/ja/currents/d00432/?pnum=2

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(Part 1)

1.Bibliography

2. About Australia

(Part 2)

3. Taxonomy and Biology of *Thenus*
4. Moulting Physiology
5. Morphological Analysis of Digestive System

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6. *Thenus* aquaculture development
7. Recirculation Aquaculture System

(Part 4)

7. Coeliac and Gluten Free
8. Science, Cooking and AI

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オーストラリア移住以前 （1966－1991）

- 大阪万博 (Expo ’70)
- 東京都江東区立浅間小学校
  - ハイドロサーマルベント（熱水噴出孔、1977）
  - 体外受精児（試験管ベイビー、1978）
- 神奈川県横須賀市立久里浜中学校
  - スペースシャトル（コロンビア、1981）
- 神奈川県立追浜高等学校
  - エイズウィルス（HIV）の発見（1983）
- 東京水産大学（東京海洋大学）水産養殖学科
  - 昭和 → 平成（1989）
- 東京水産大学、種苗生産学講座（修士）
  - “新人類世代” “バブル世代”

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Three reasons why decided to go to Australia

1.GBR

2. Professor Greenwood

1991

3.English

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1. Great Barrier Reef (GBR)

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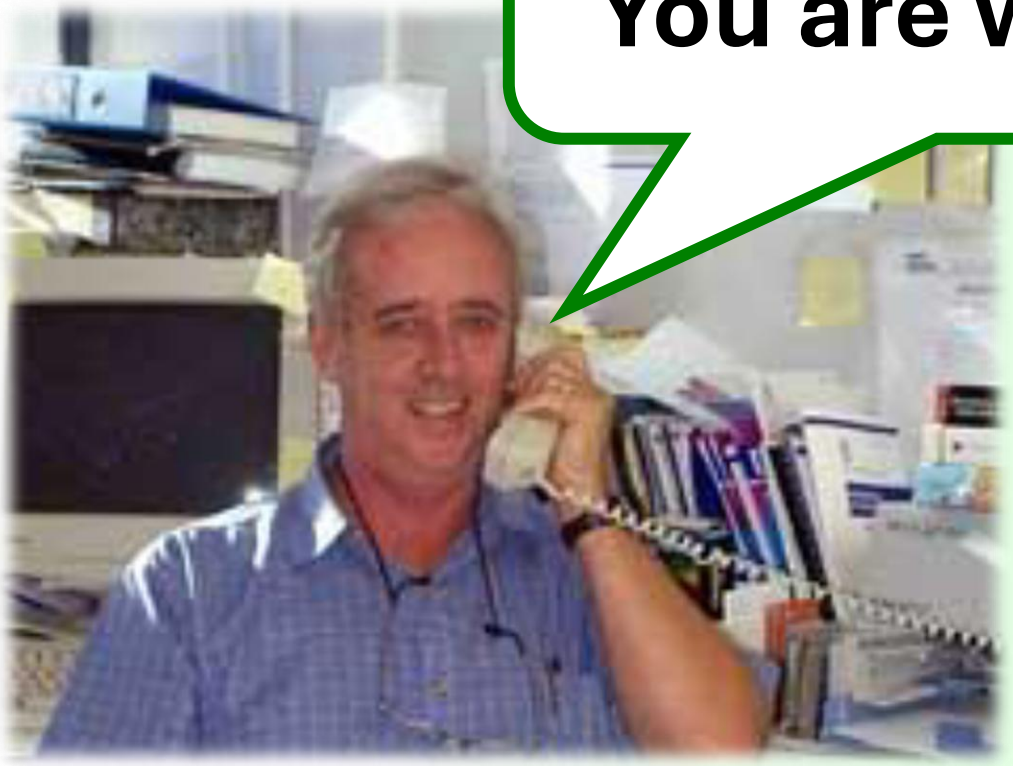
2. Professor Jack Greenwood



- The University of Queensland
  - Met at Tokyo in 1990
    - PhD supervisor
    - Retired in 2010

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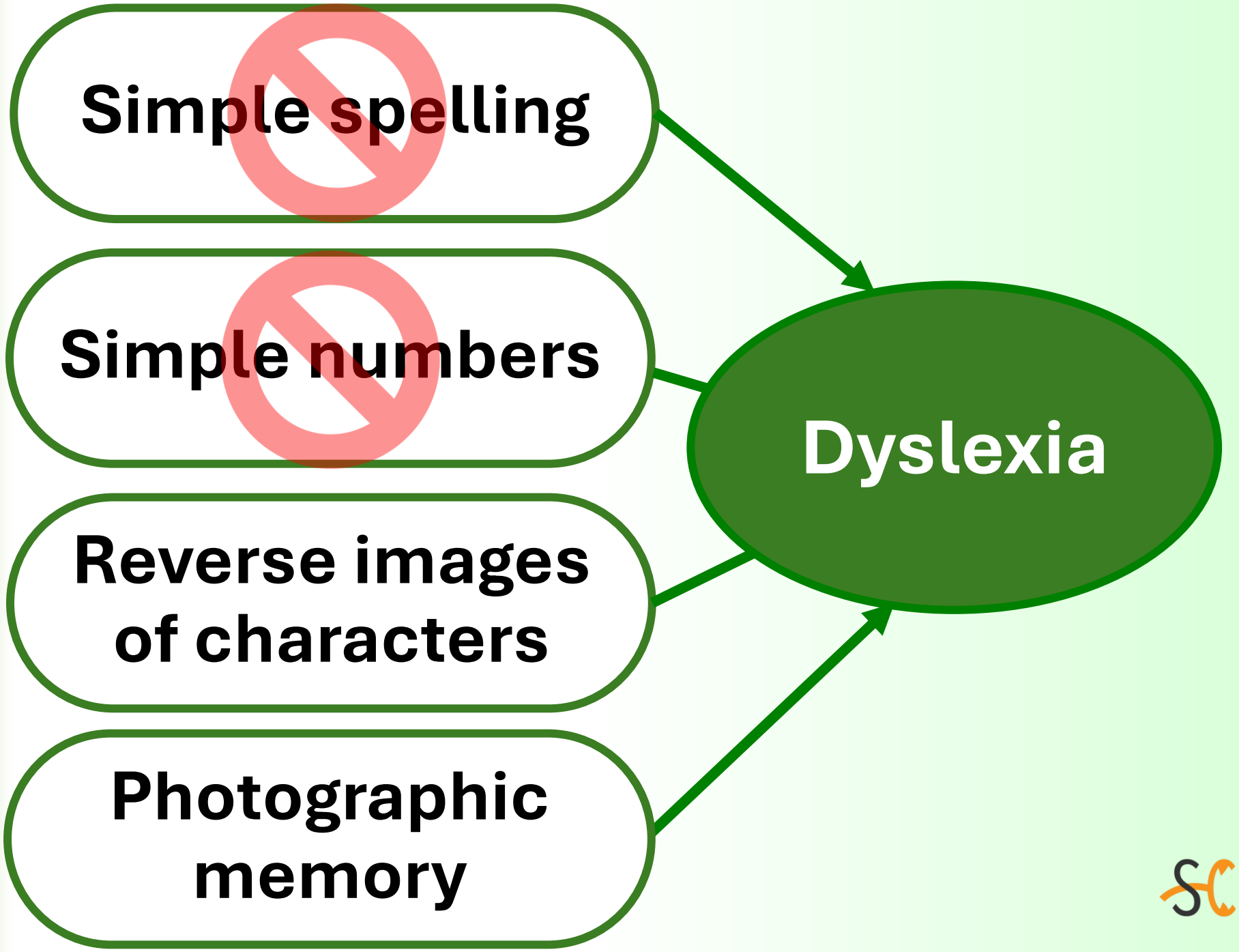
3. Language (English)



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3. Language (English)

Dyslexia

Learning difficulty

Reading

Spelling

Neurobiological condition

No reflection of intelligence

Can be managed

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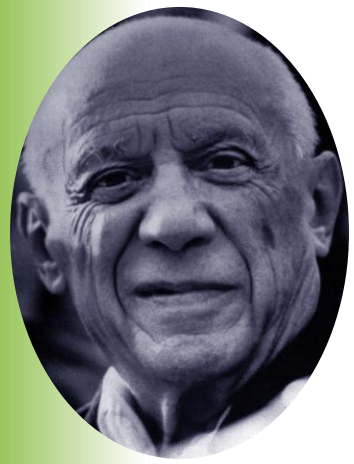
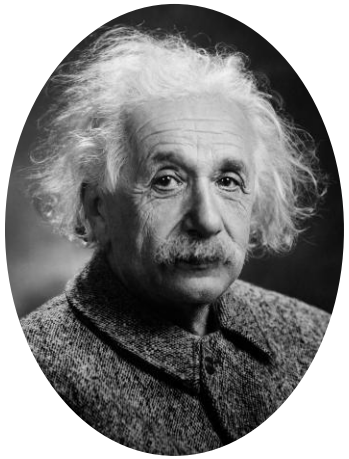
3. Language (English)



Dyslexic famous people (Example)

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Life in Australia

3+6 M Student → 3 Years Student → Permanent Resident → Citizenship

1991	1992	1995	2007	2019	2024
English	PhD	R&D Manager of AFC		Project Manager of ABLP	Scylla

35 years of “**Rip Van Winkle**” feeling

（やばい/やべえ、まじ、すげえ、がち…）

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3. Language (English)

English

My weak Point

Creating situation of no choice

Stop translating

Creating another part of brain

All English words come from sound

Dyslexia

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Why Google translate is not enough

Translating from main language to second language

Creating another part of brain to think in a second language

Learning a second language leads to significant brain changes

Way of seeing world differently

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1. Location

Tropic of Cancer
(23° 26' 22" North)
Cancer (かに座): 22 June

Tropic of Capricorn
(23° 26' 22" South)
Capricorn (やぎ座): 22 December

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2. Visitors

120 million

1 million
(2024)

26.64 million

360,120
(2024)

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3. Trade

AUD 90B

Coal
gas (LNG)
Iron ore
Copper
Aluminium
Zinc
Nickel

AUD 30B

Car
Auto parts
Machinery
Electrical
Electronic
equipment

AUD 1B = JPY 1000 million

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5. Australian Animals

Marsupials

Monotremes

Natives

Dingo

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6. Invasive noxious species

Noxious

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7. Society (1)

Found 237 years ago
124 years constitutionally

English
(Officinal language)

Multiculturism

Compulsory Voting

Japan: 50-55% Aust: 89-90% ($20 fine)

7. Society (2)

$AU, Swedish Rounding, Polymer bank note

Higher Education Contribution Schem (HECS)

Japan: 59.1%, 2,143,200 yen
Aust: 53%, $27,640

Medicare (2%) + Private Insurance

Reserve financing scheme (積み立て）
Pay-as-you-go system（賦課方式）

Superannuation system

8. About Aussie (Stereotype)

Dry sense of humour

Laid back and easy going

Multiculturism

Resilient

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9. Aussie English

“a” sounds “ai”

A non-rhotic pronunciation (no "r" sound at the end of words)

Shortening word

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9. Aussie English (Quiz)

"Chuck a u-ey at Macca's mate"

G’day, Good on ya, Mate, Chrissie, Arvo, Avo, Brekky, Bogan, Bludger, Macca’s, Fair dinkum, Thongs, Esky etc…

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Frequently asking questions (FAQ)

Q1. Is Santa Claus coming by Surfing?

Q2. Do you dream in English or Japanese?

Q3. What is the best way to learn English?

Q4. Can I earn more than $100,000?

Contents

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Order Decapoda

Suborder Dendrobranchiata

Infraorder Astacidae

Superfamily Astacoidea

Family Astacidae, Cambaridae

Superfamily Nephropoidae

Family Nephropidae (Clawed lobster)

Homarus, Thympos, Nephrops, Thymopides, Metanephrops, Nephropsis, Eunephrops, Nephropides, Tymopsis, Acanthacaris

Family Thaumastochelides

Infraorder Palinura

Superfamily Eryonoidea

Family Polychelidae

Superfamily Palinuroidae

Family Palinuridae (Rock lobster)

Palinurus, Linuparus, Panulirus, Sagmariasus, Palinustus, Justitia, Puerulus, Jasus, Projasus

Family Scyllaridae (Slipper Lobster)

Genus *Syllarus, Parribacus, Scyllarides, Evibacus, Arctides, **Thenus**, Ibacus*

Family Synaxidae (Coral lobster)

Palinurellus

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Basic information of *Thenus*

(*Thenus australiensis*)

- Indo-Pacific waters
- Slipper lobster, shovelnose lobster, Flathead lobster, Bay lobster, Morton Bay bug , Uchiwaebi-Modoki
- Tropical and co-tropical waters
- Bottom dweller
- Molluscs feeder
- Nocturnal
- 5 species within genus of *Thenus*

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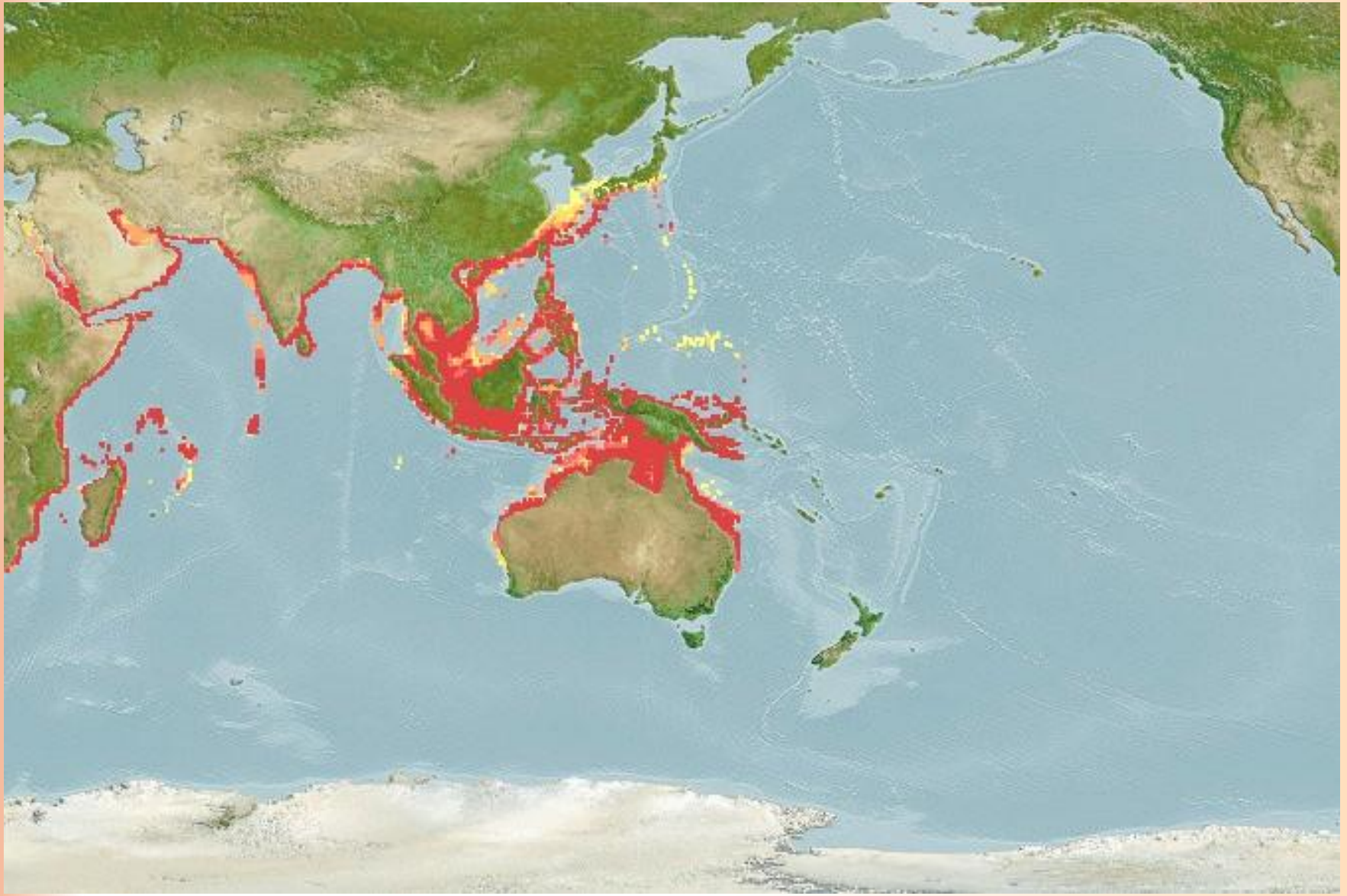

Computer Generated Native Distribution Map for *Thenus orientalis* (flathead lobster), with modelled year 2050 native range map based on IPCC RCP8.5 emissions scenario
(Sauce: https://www.aquamaps.org/receive.php?type_of_map=regular&map=cached)

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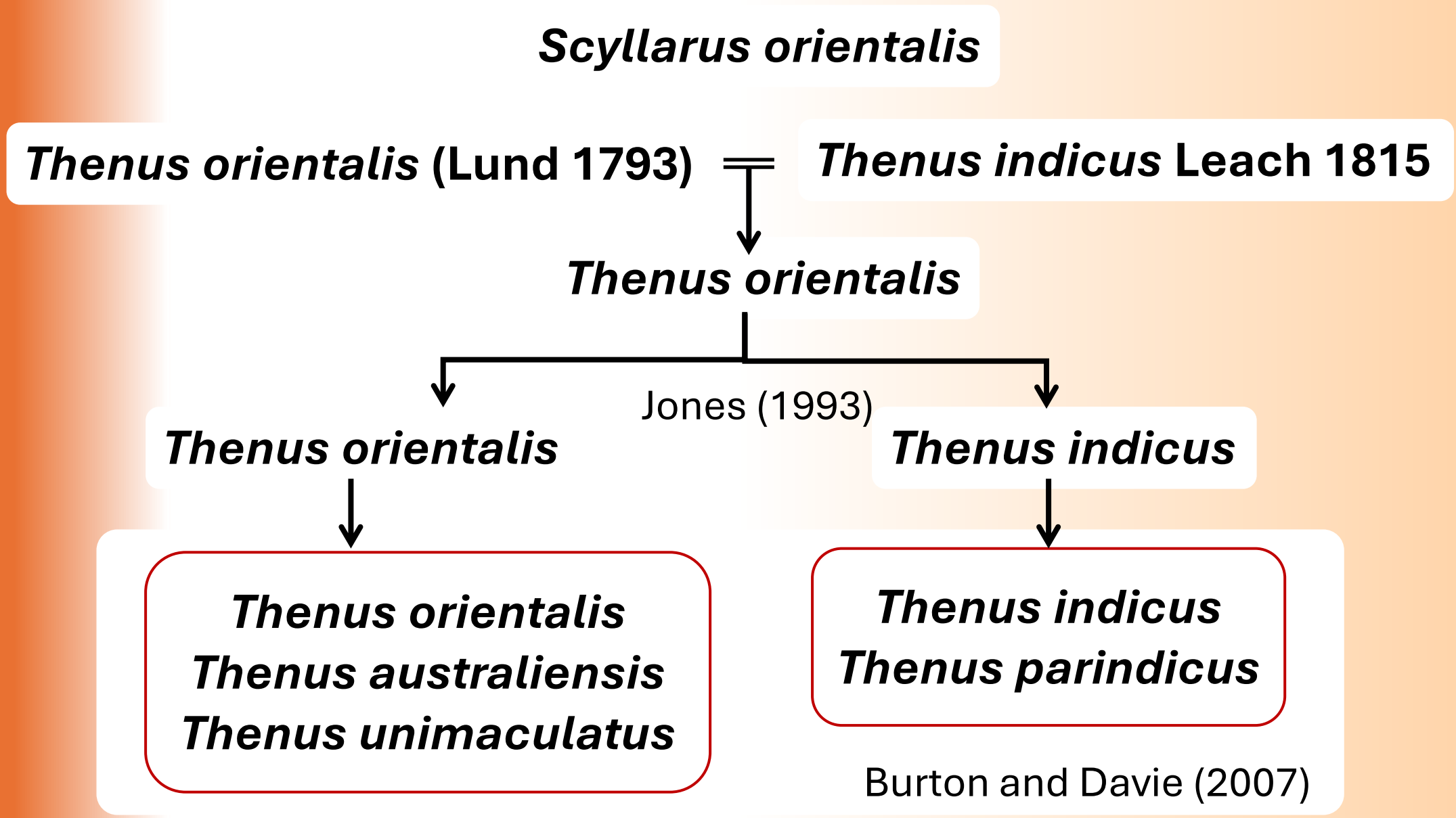
Scyllarus orientalis
Thenus orientalis (Lund 1793)
Thenus indicus Leach 1815
Thenus orientalis
Jones (1993)
Thenus orientalis
Thenus indicus
Thenus orientalis
Thenus australiensis
Thenus unimaculatus
Thenus indicus
Thenus parindicus
Burton and Davie (2007)

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T. australiensis

T. orientalis

T. unimaculatus

T. indicus

T. parindicus

Burton, T.E.; Davie, P.J.F. (2007). A revision of the shovel-nosed lobsters of the genus *Thenus* (Crustacea: Decapoda: Scyllaridae), with descriptions of three new species. *Zootaxa.* 1429: 1-38.

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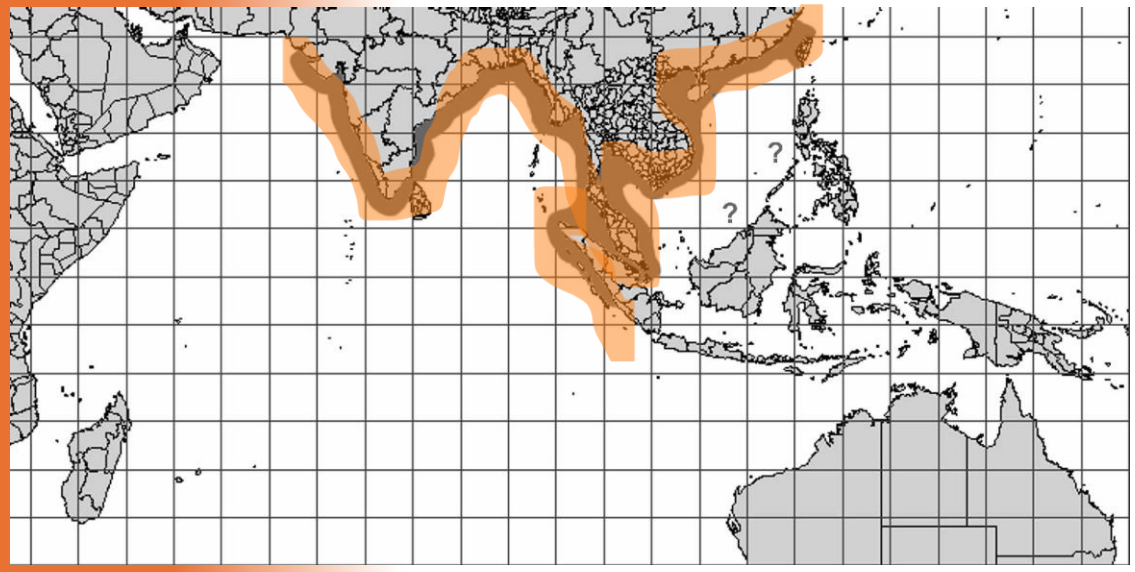
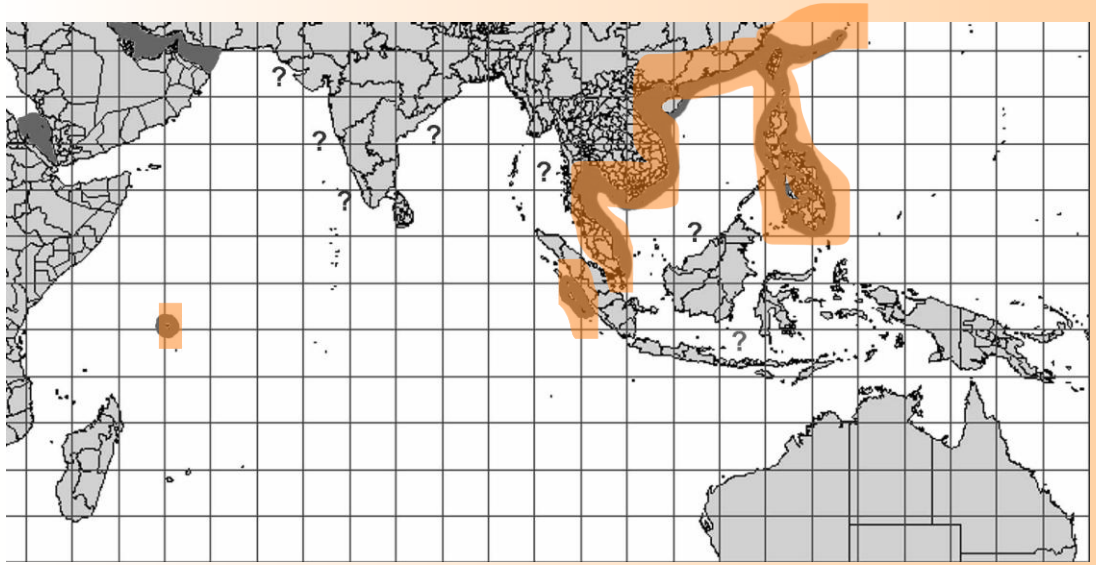
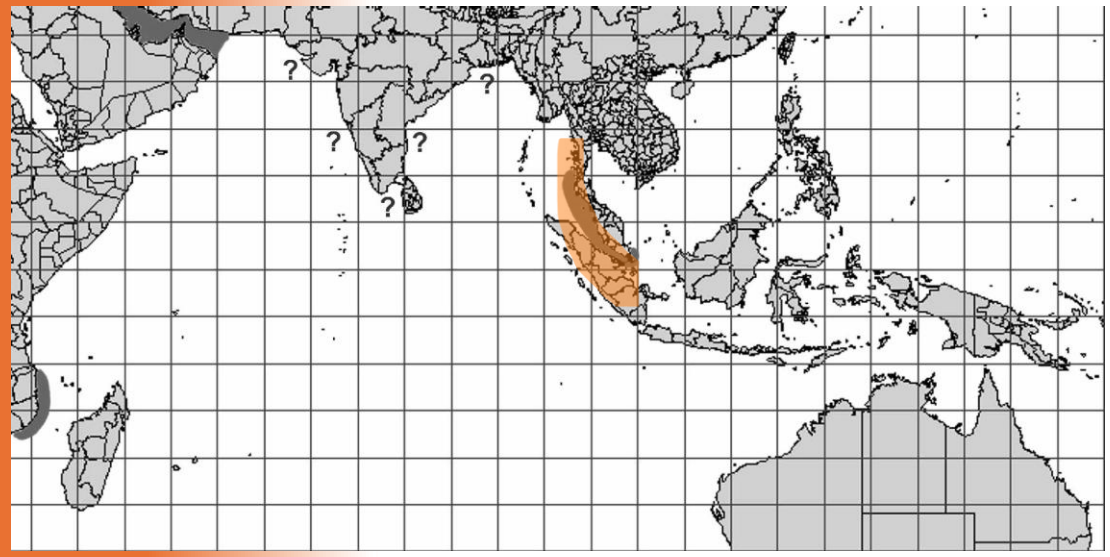


***Thenus indicus* Leach, 1815**



***Thenus orientalis* (Lund, 1793)**



***Thenus unimaculatus* sp. nov.**

Burton, T.E.; Davie, P.J.F. (2007). A revision of the shovel-nosed lobsters of the genus *Thenus* (Crustacea: Decapoda: Scyllaridae), with descriptions of three new species. *Zootaxa.* 1429: 1-38.

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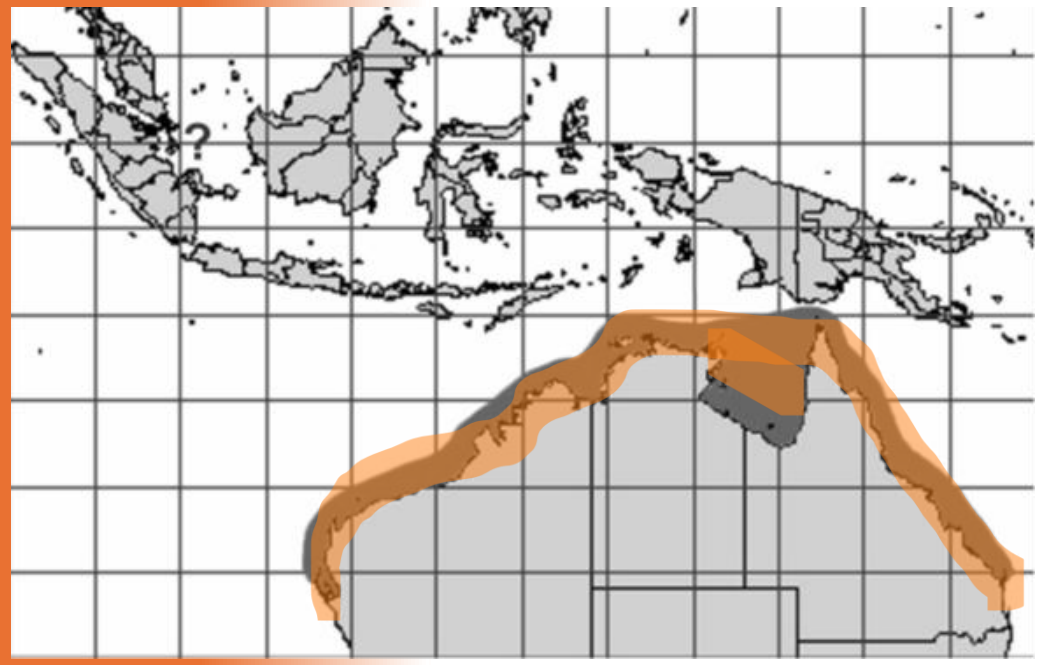
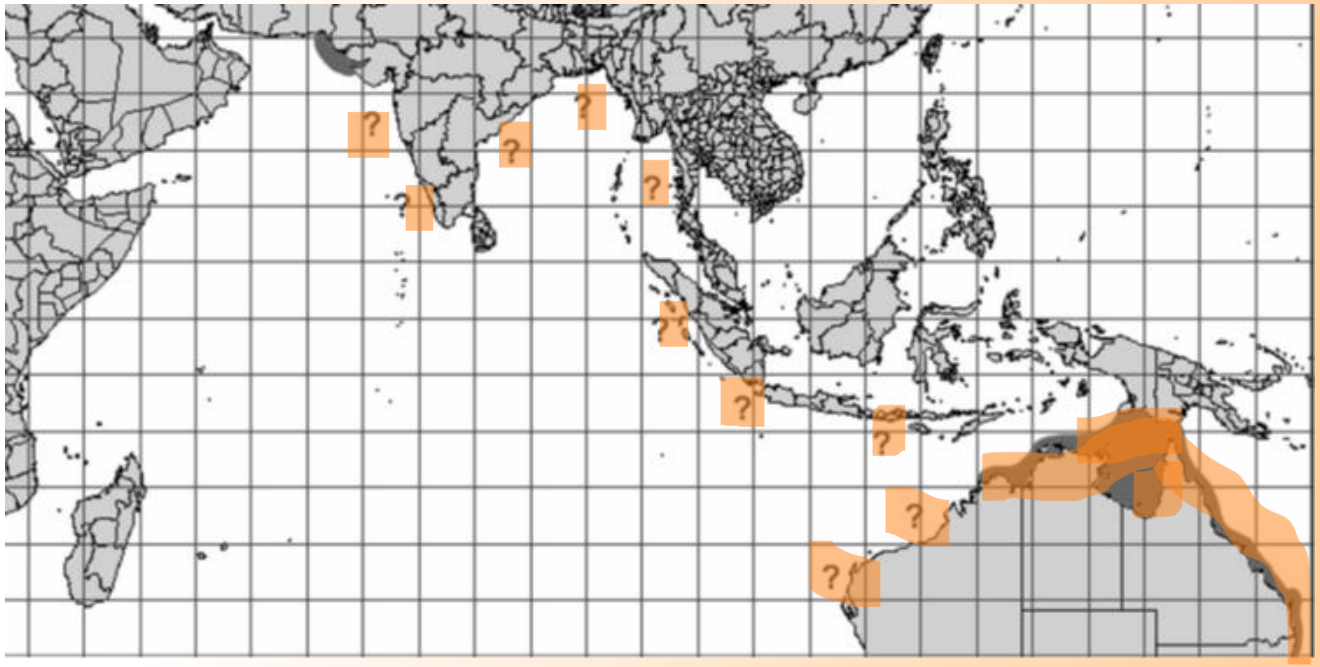


Thenus australiensis



Thenus parindicus

Burton, T.E.; Davie, P.J.F. (2007). A revision of the shovel-nosed lobsters of the genus *Thenus* (Crustacea: Decapoda: Scyllaridae), with descriptions of three new species. *Zootaxa.* 1429: 1-38.

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(a) Sand bug *T. australiensis*, indicating spots on their walking legs and
(b) Mud bug *T. parindicus* indicating stripes on walking legs.

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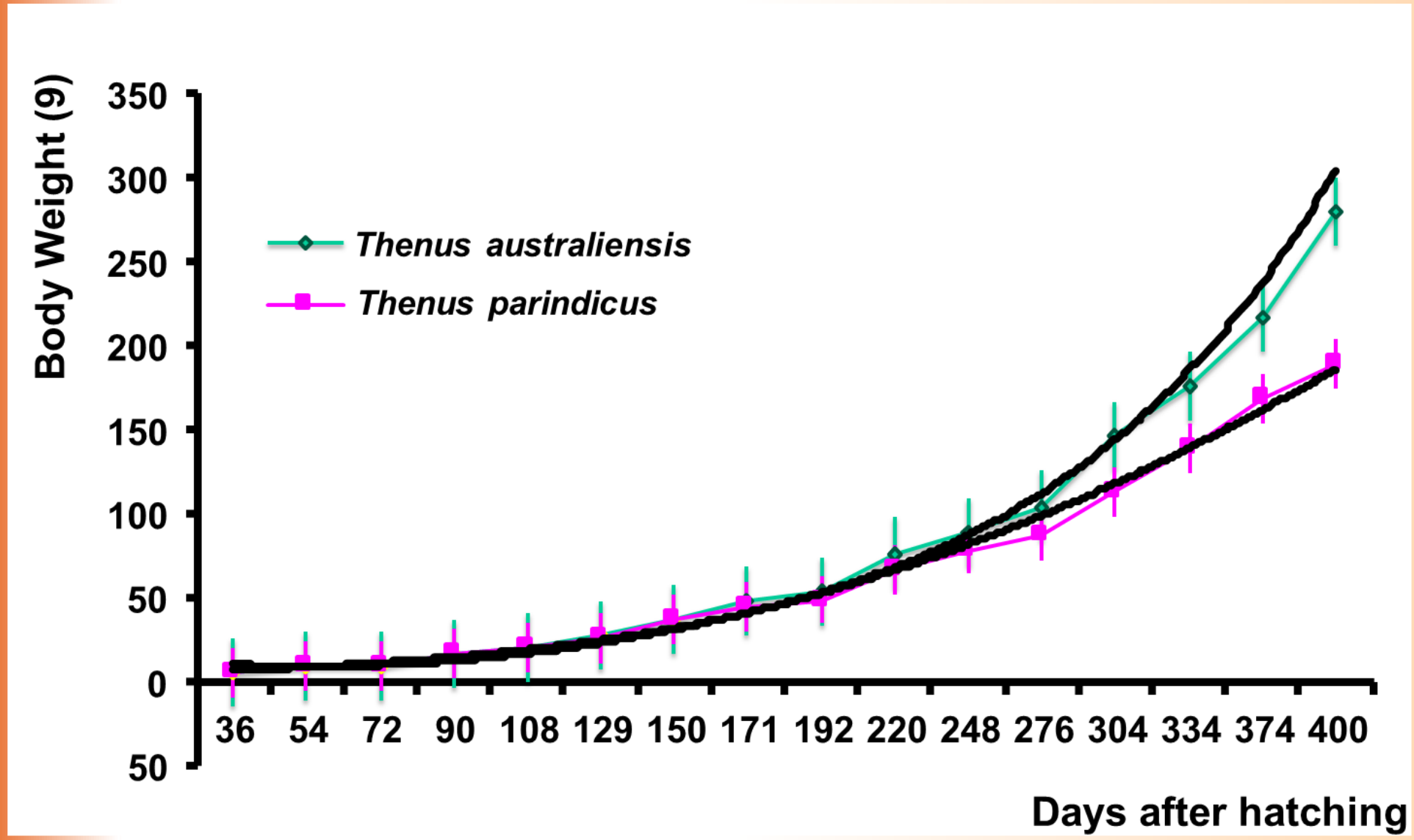

Growth of *Thenus australiensis* and *Thenus parindicus*

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Growth phases of *Thenus* (Larval)

Phyllosoma stages

- Four moult stages
- Av. 3.9mm (1st stage)
- Av. 6.7mm (2nd stage)
- Av. 10.9mm (3rd stage)
- Av. 18.2mm (4th stage)
- App. 25 days at 27°C
- Uncalcified exoskeleton

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Growth phases of *Thenus* (Nisto)

Nisto stage

- Equivalent to Puerulus
- Uncalcified exoskeleton
- Non-feeding stage
- Seven days at 27ºC

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Growth phases of *Thenus* (Post-larval)

Post larval stages

- Juveniles moult every 5-7 days at 27°C
- Molluscs feeder
- Biological minimum size of app. 180g (8 months from hatching)
- App. 400 days to reach 250g (19 moults) from hatching at 27°C

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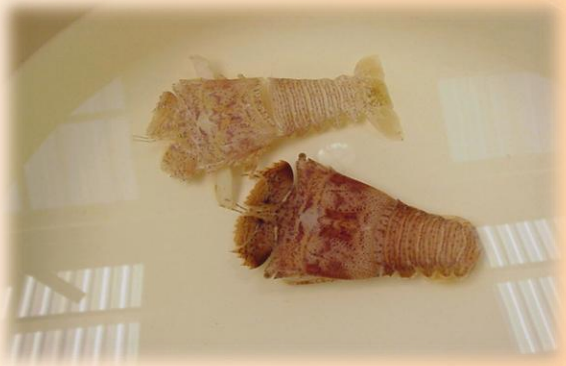
What is Crustacean moulting?

The process of shedding a hard exoskeleton to make room for a new and softer body



Complex, cyclic process, essential for growth and reproduction

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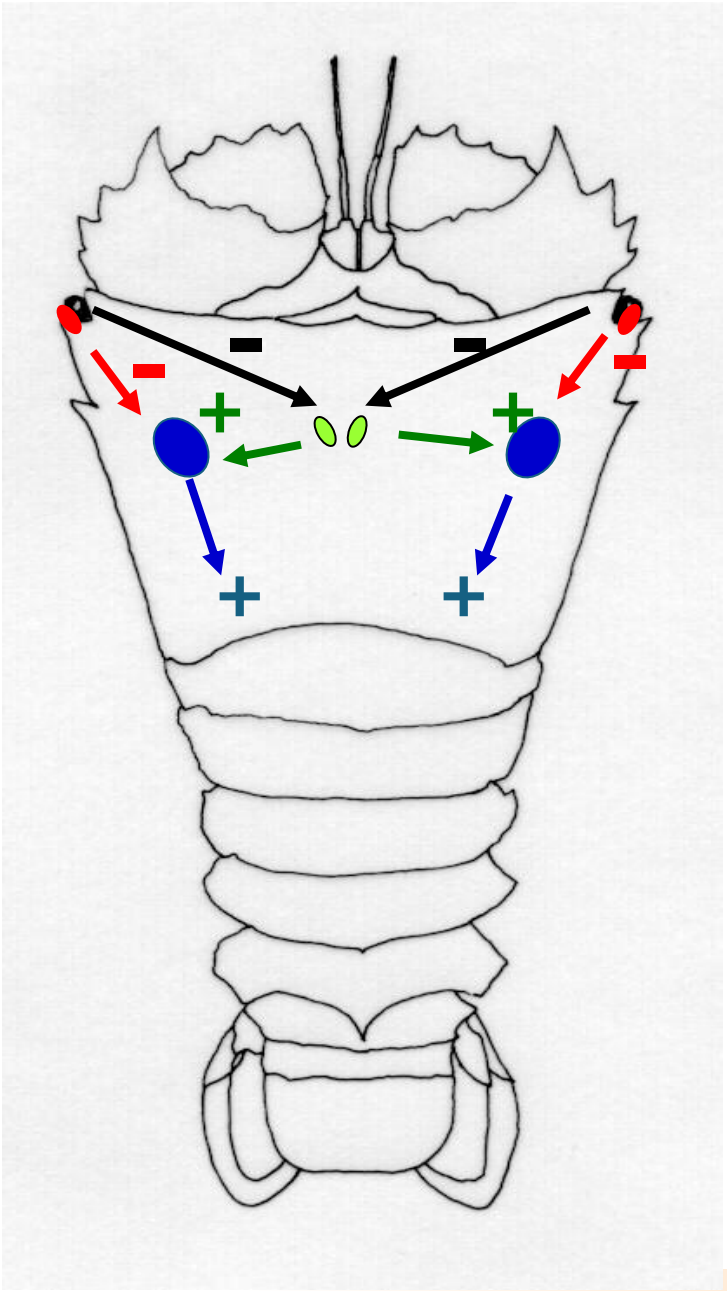
Hormones involved in moult regulation

X-Organ Sinus Gland System

Y-Organ

Mandibular Organ



Moult Inhibiting Hormone (MIH)
Mandibular Organ Inhibiting Hormone (MO-IH)

Methyl Farnesoate (MF)

Ecdysteroids (Ecdysone)

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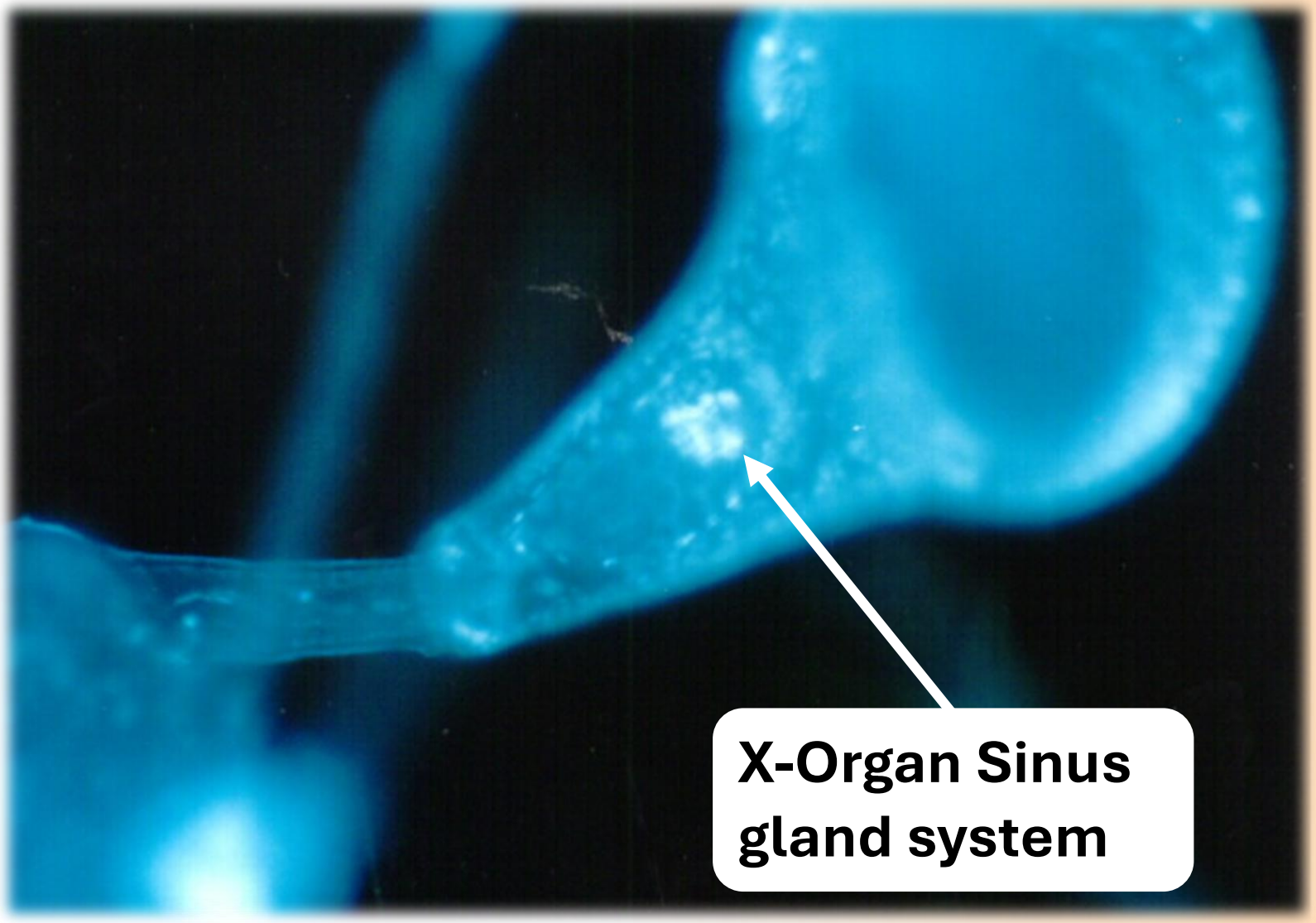
Eye-stalk of phyllosoma under fluorescence microscope



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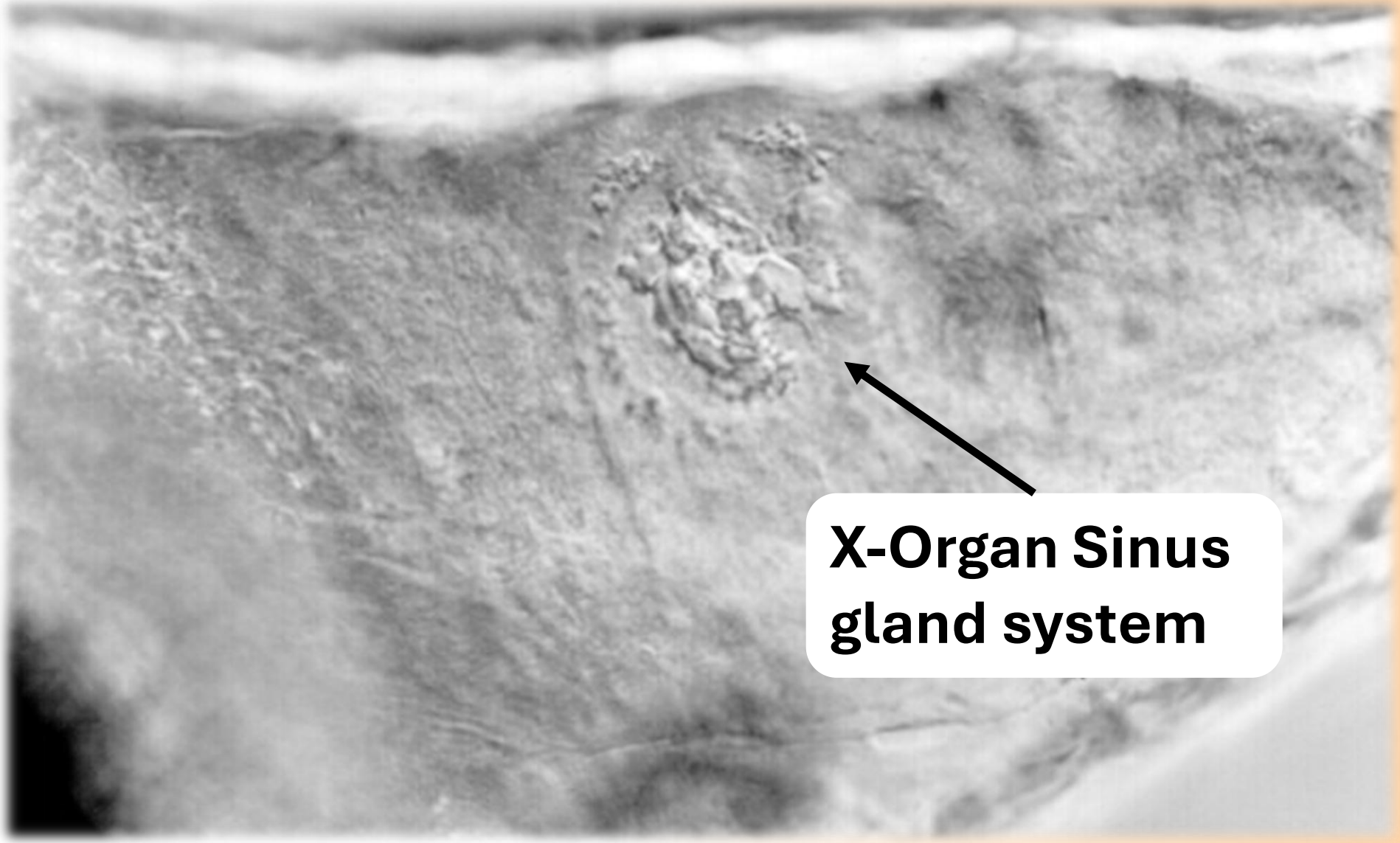
Eye-stalk of phyllosoma under DIC microscope



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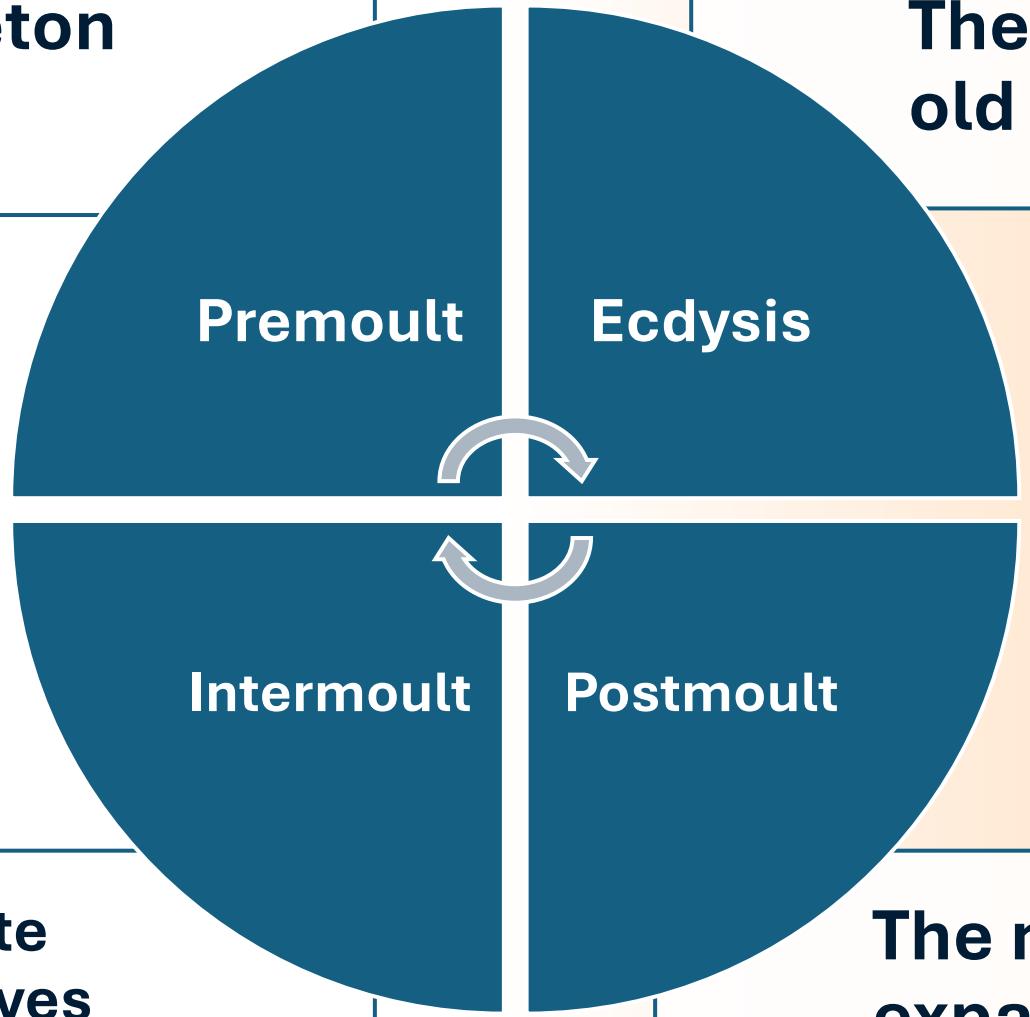
Moult stages

New exoskeleton is formed

The shedding of the old exoskeleton



Muscle regenerate and energy reserves are built up

The new exoskeleton expands and hardens

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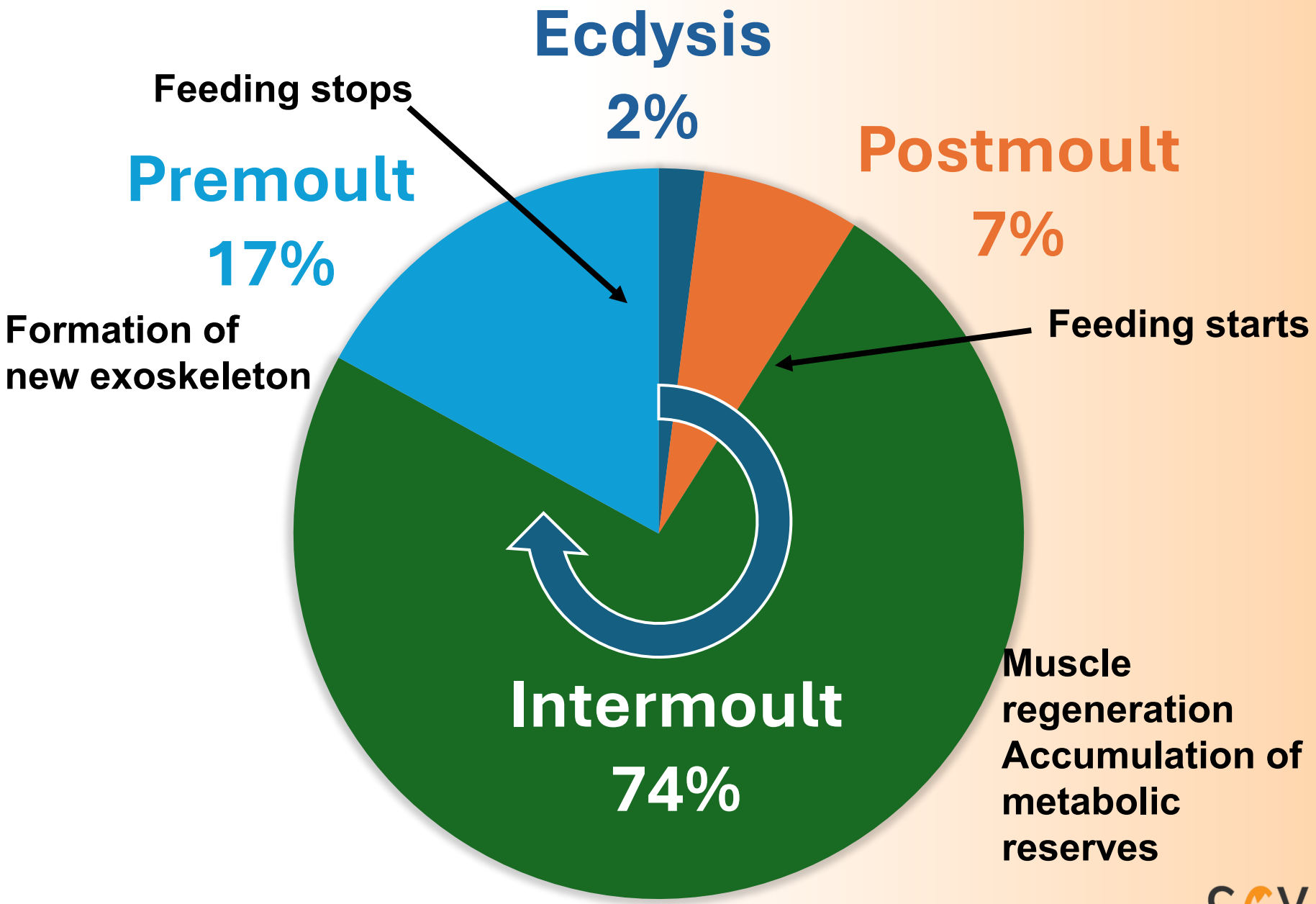
Moult stages



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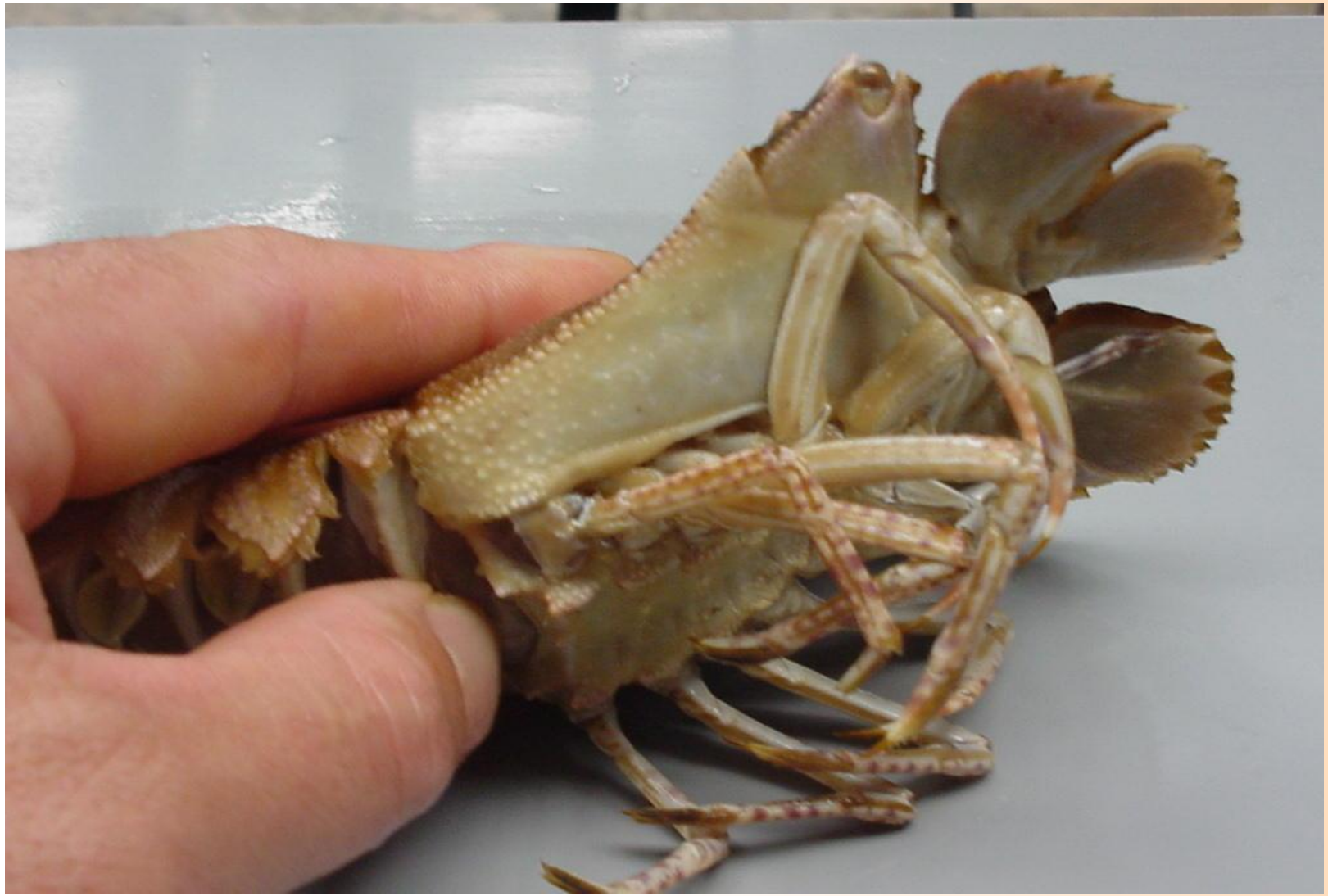
Intermoult



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Premoult

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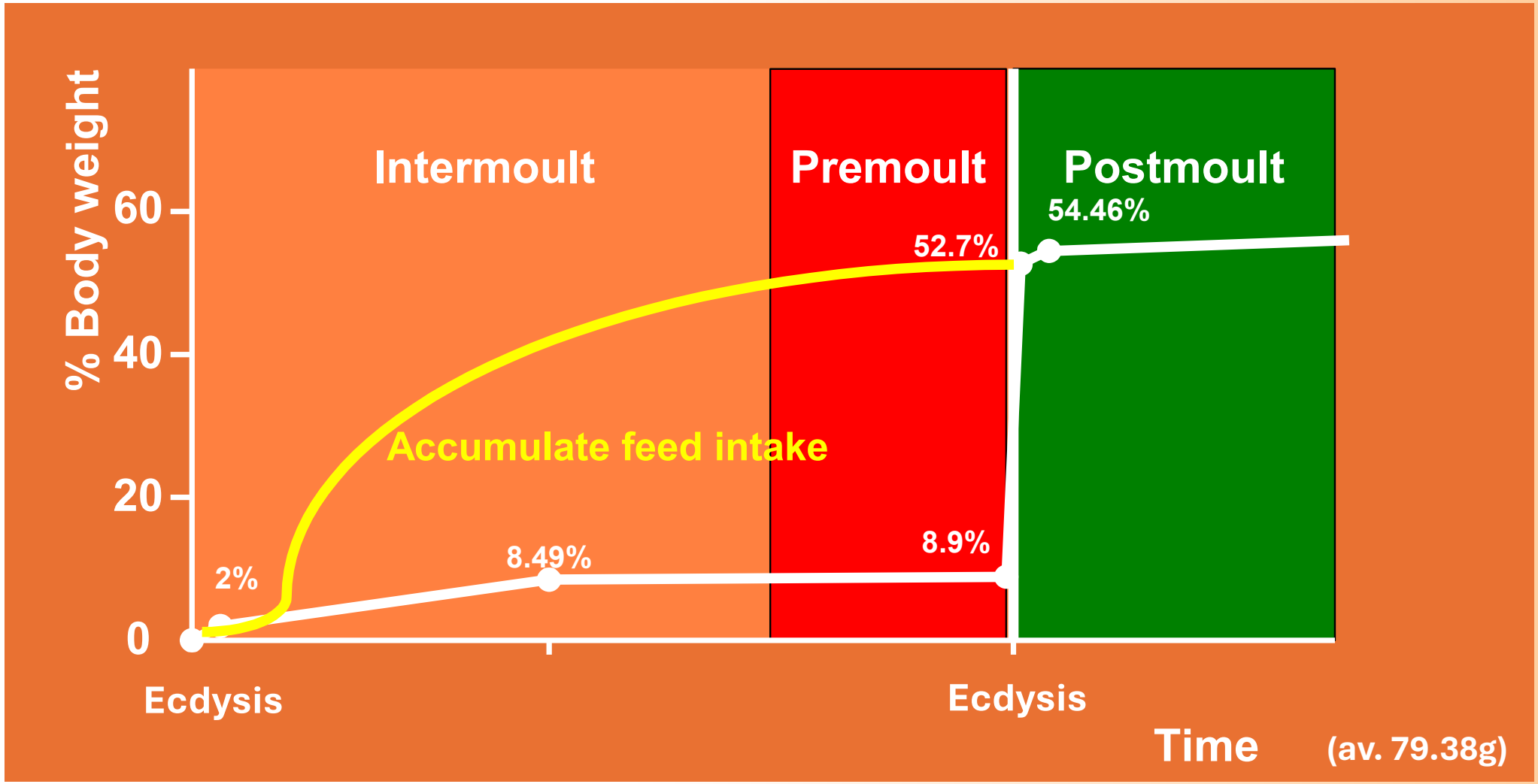
Change of wet body weight between moults



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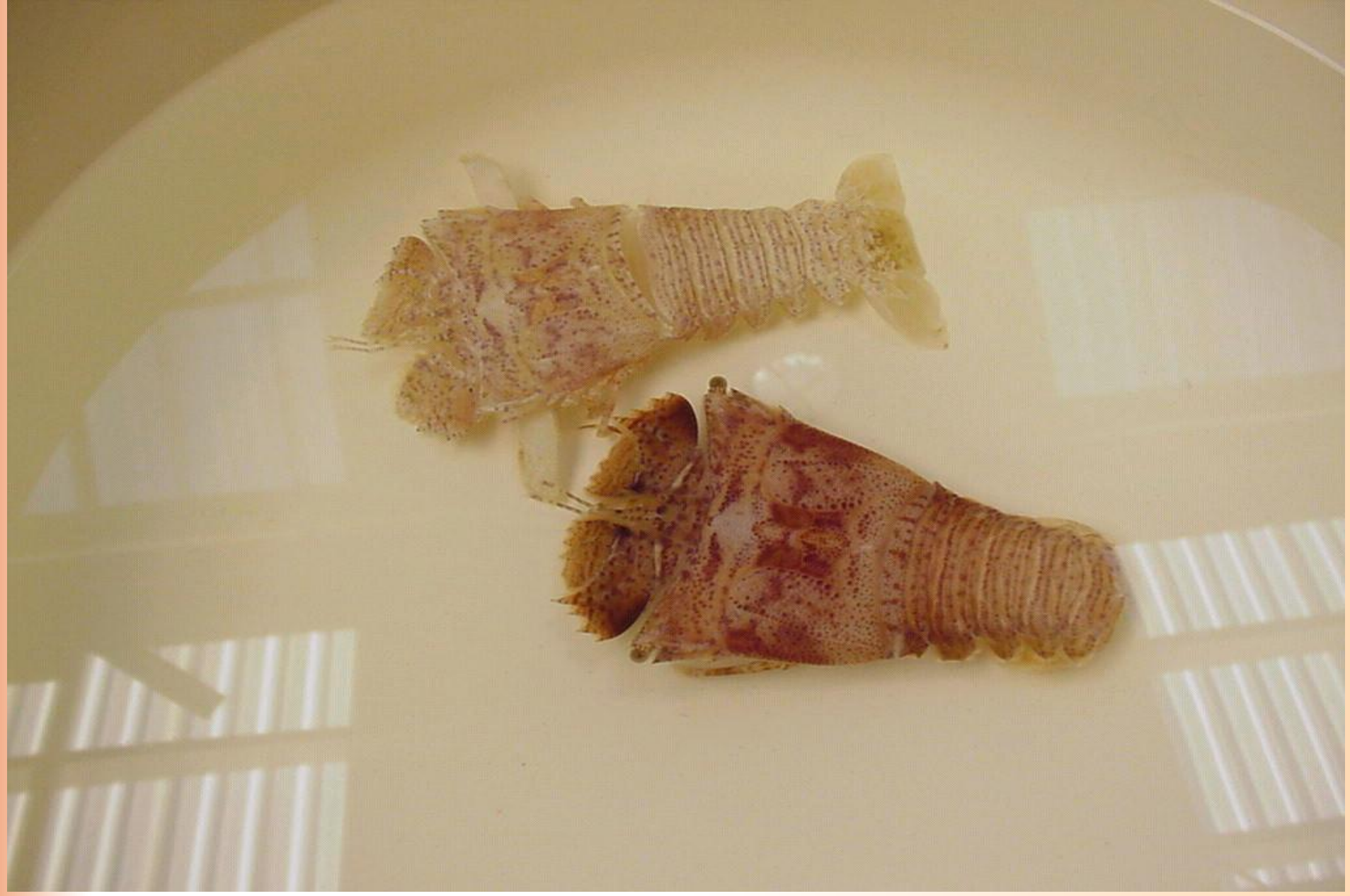

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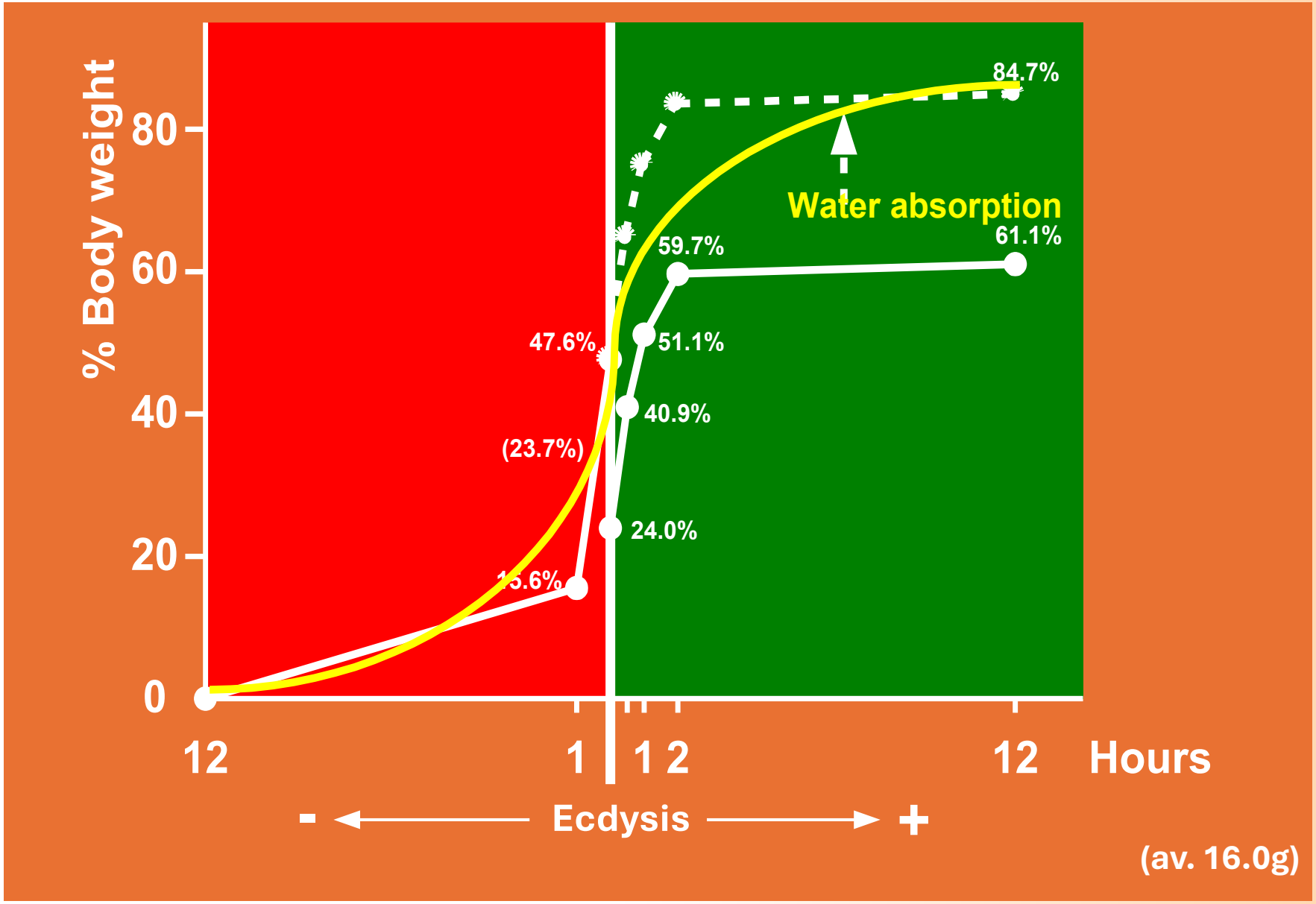
Change of wet body at the time of actual moult



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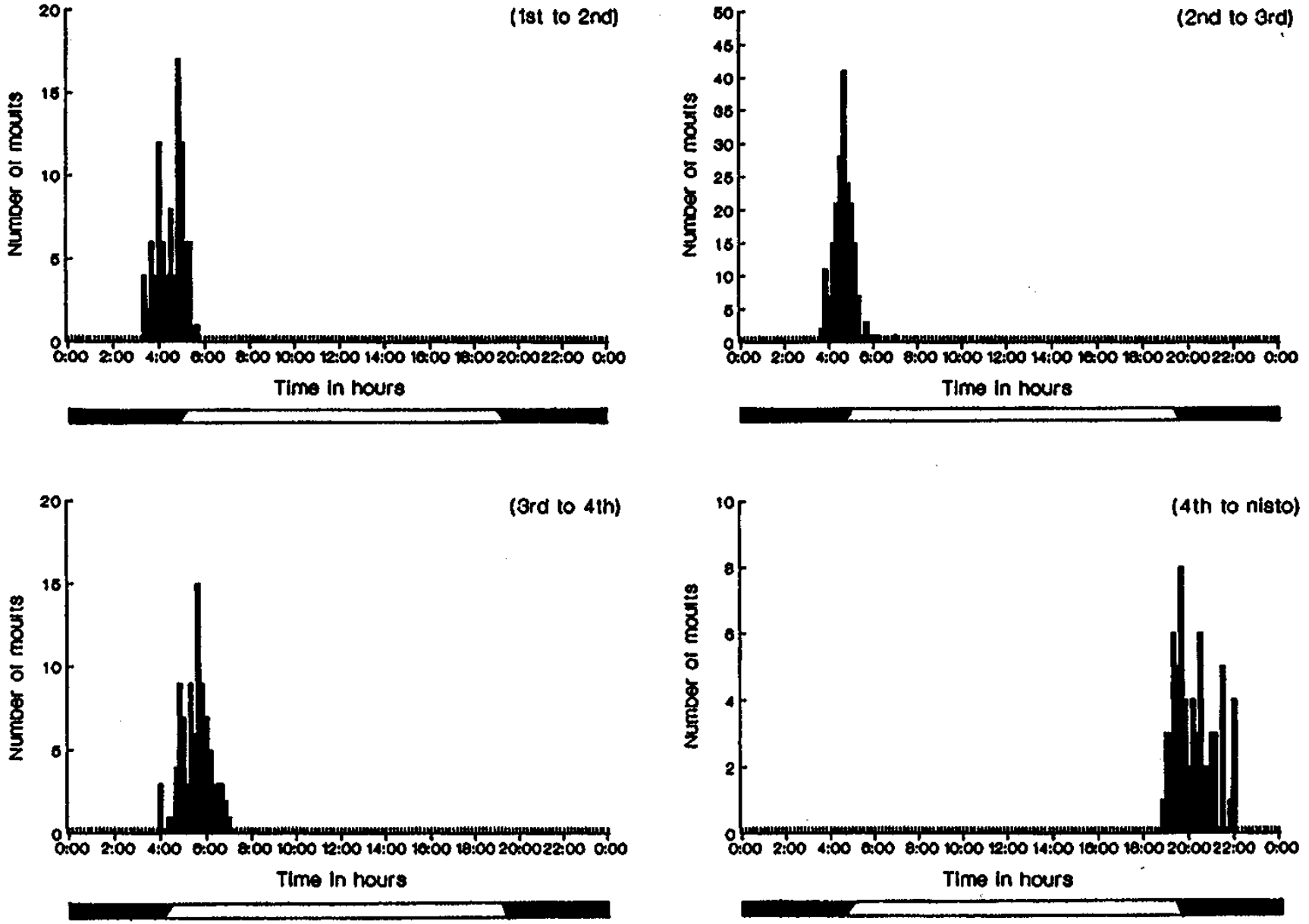
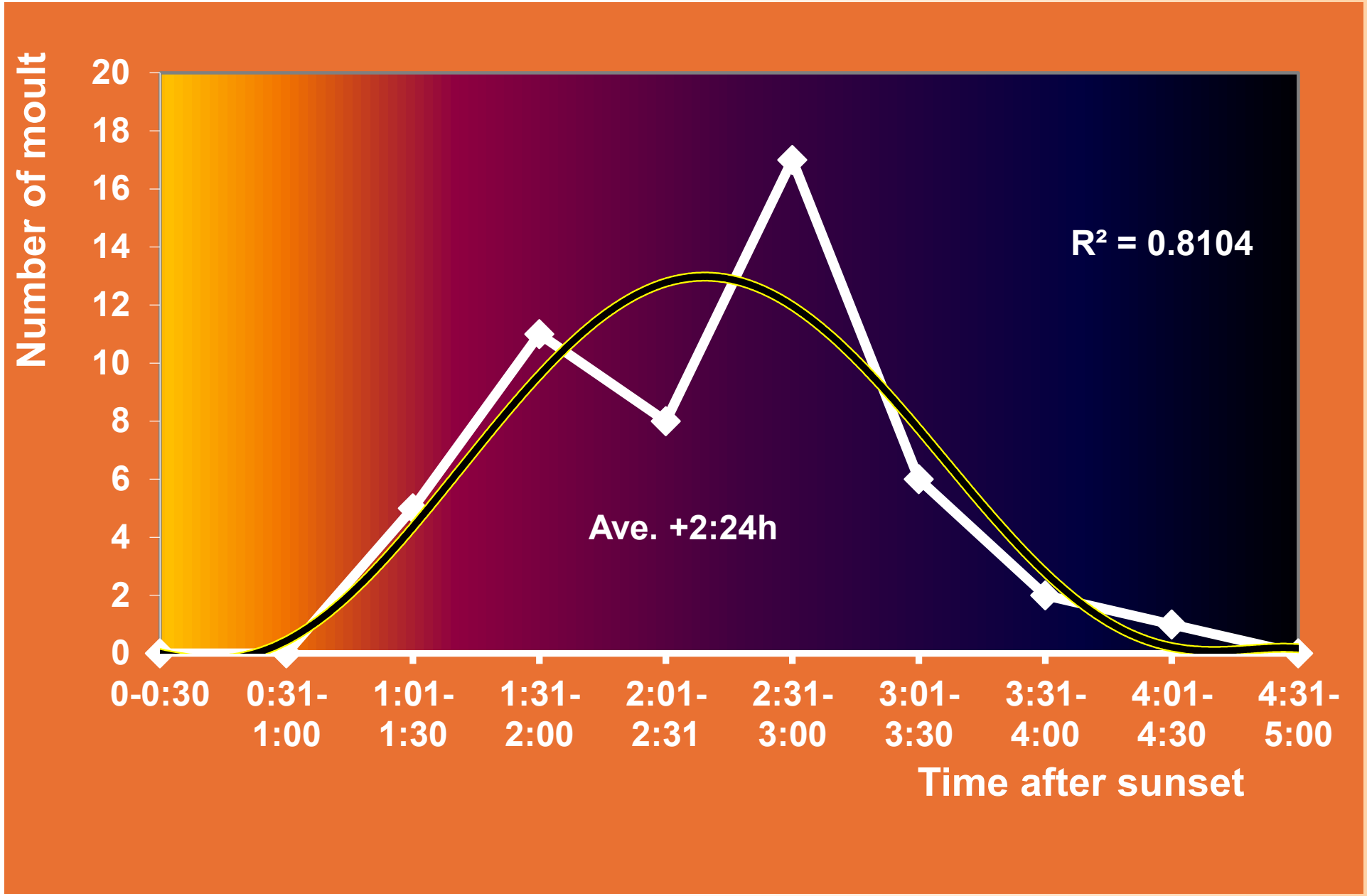


Fig. 1. Diel timing of phyllosomal moulting and metamorphosis to the nisto stage in *Thenus orientalis* reared under natural light.

Diel timing of moult under natural light condition



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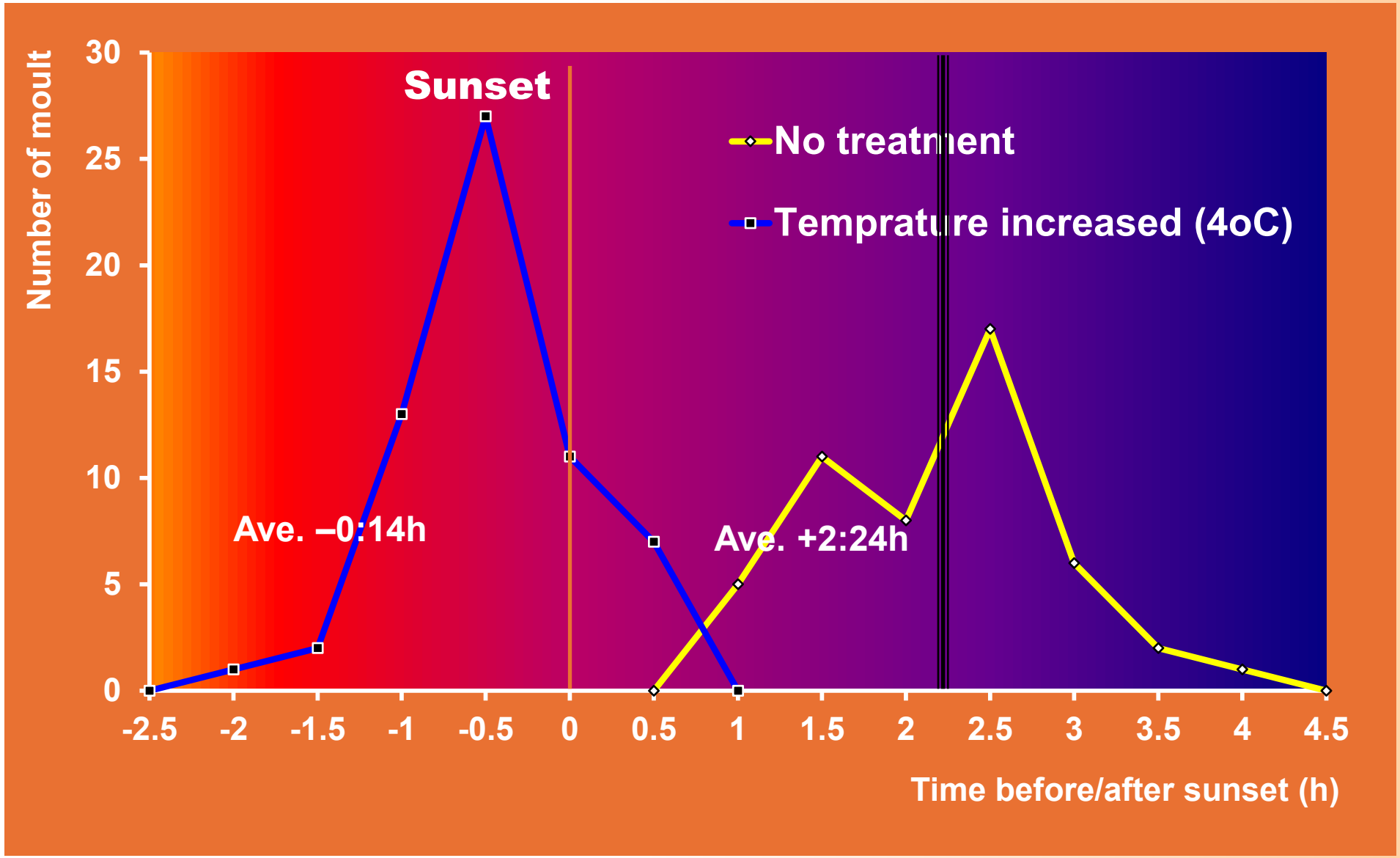
The effect of temperature on diel timing of moult



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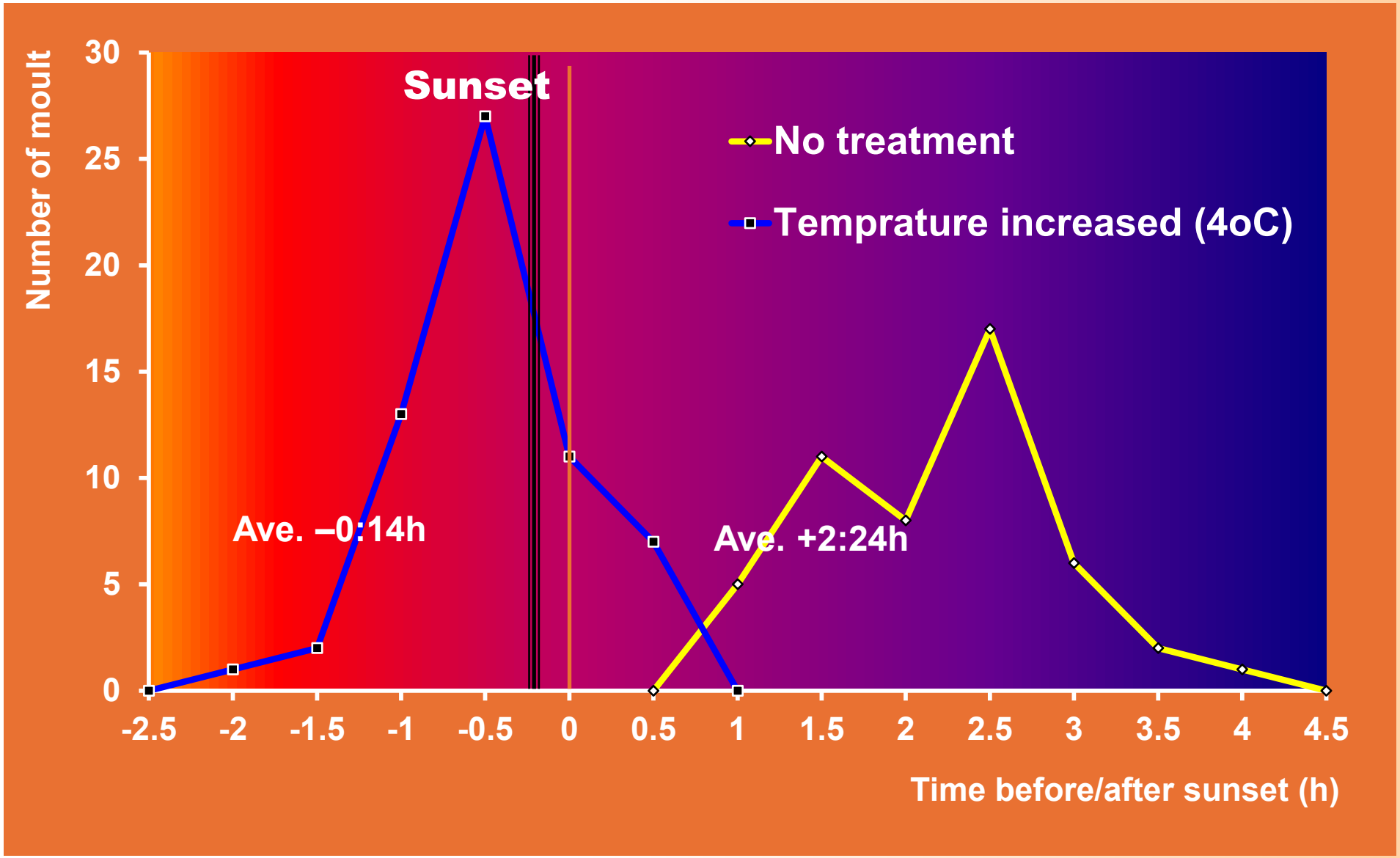
The effect of temperature on diel timing of moult



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Summary of crustacean moulting

A complex interplay of hormones

Including those that promote and inhibit moulting, regulates the process

External factors

Like temperature, nutrition, and photoperiod can affect moulting

Understanding and controlling moulting

Could have significant commercial applications, such as propagating seafood products

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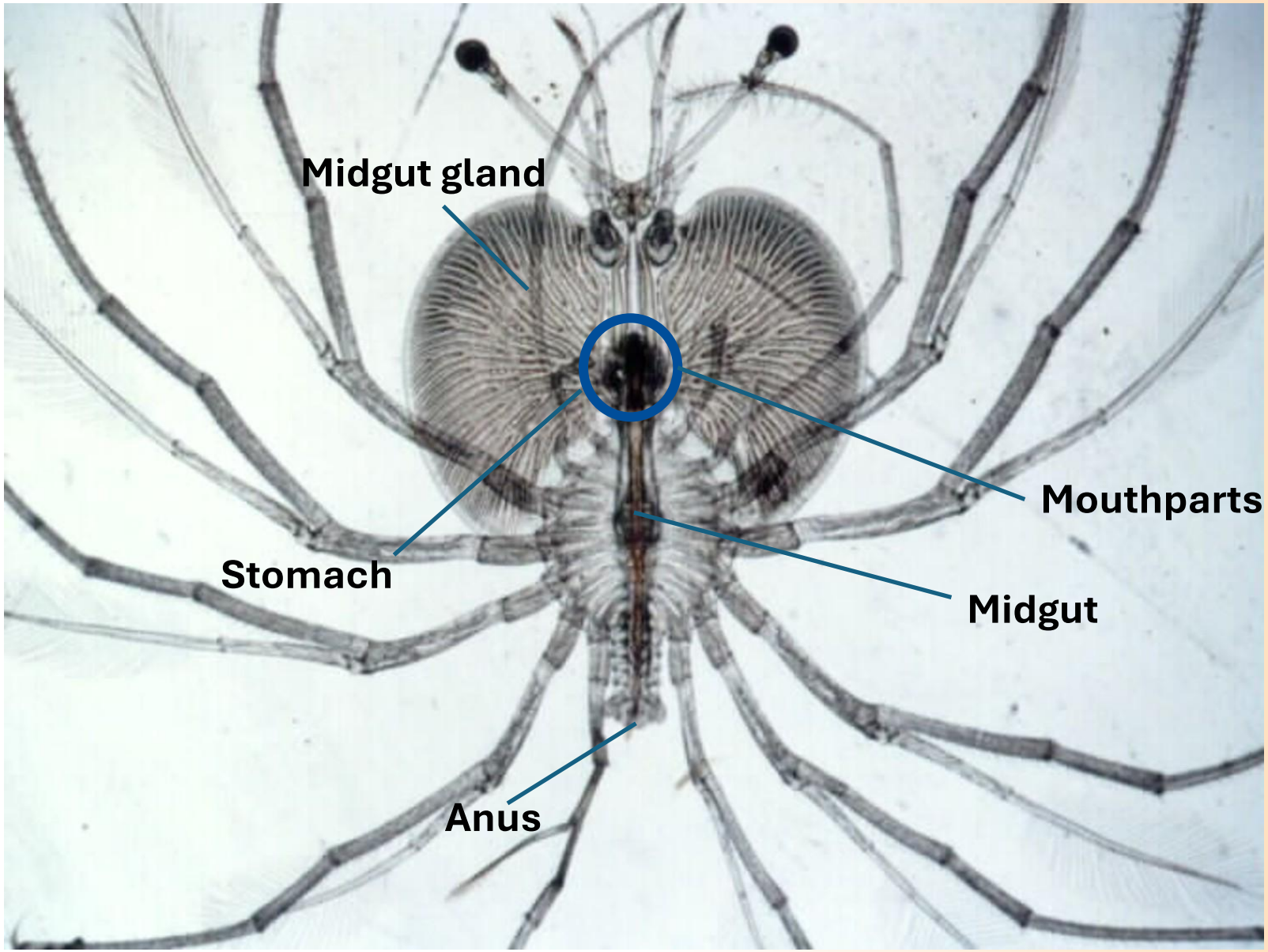
Digestive system of phyllosoma



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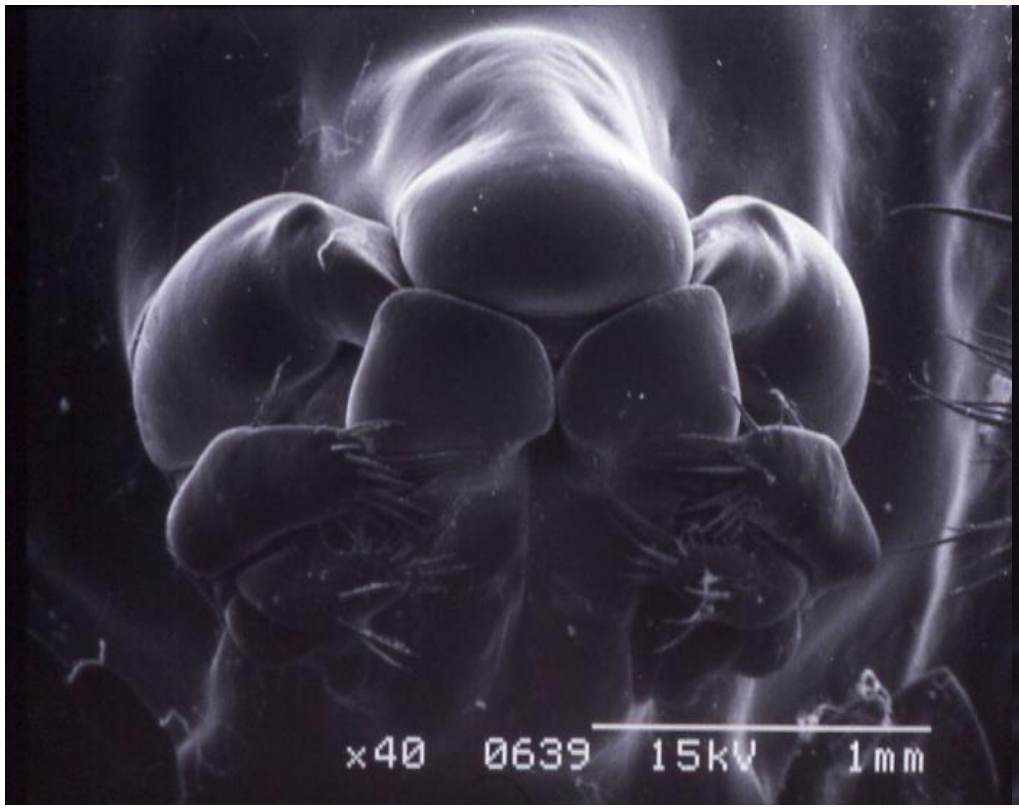
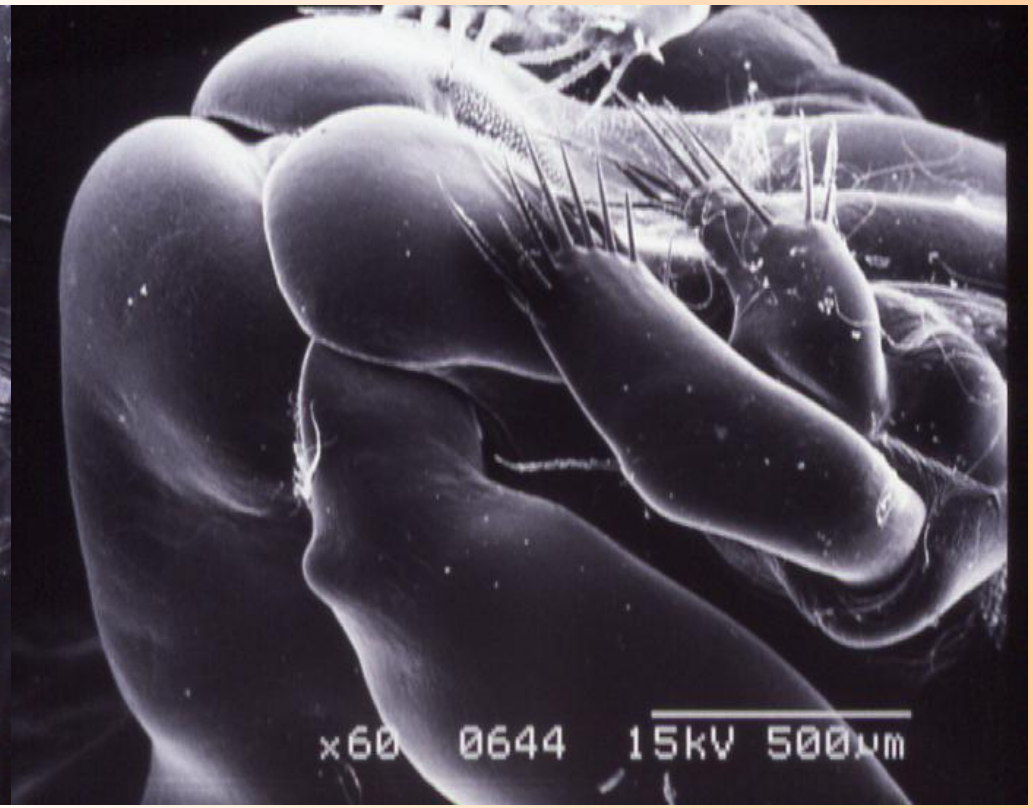
The mouthparts of the phyllosoma





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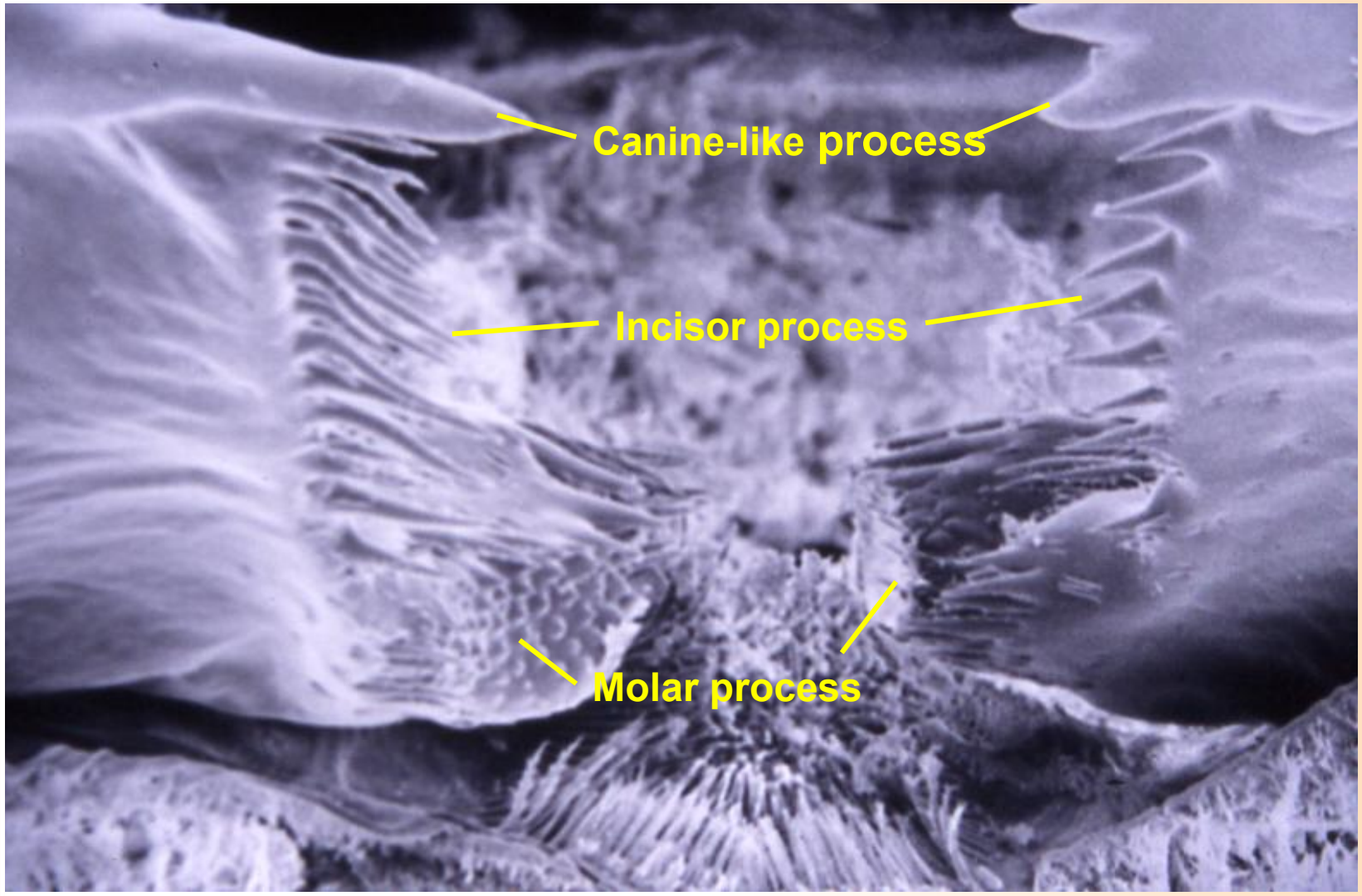

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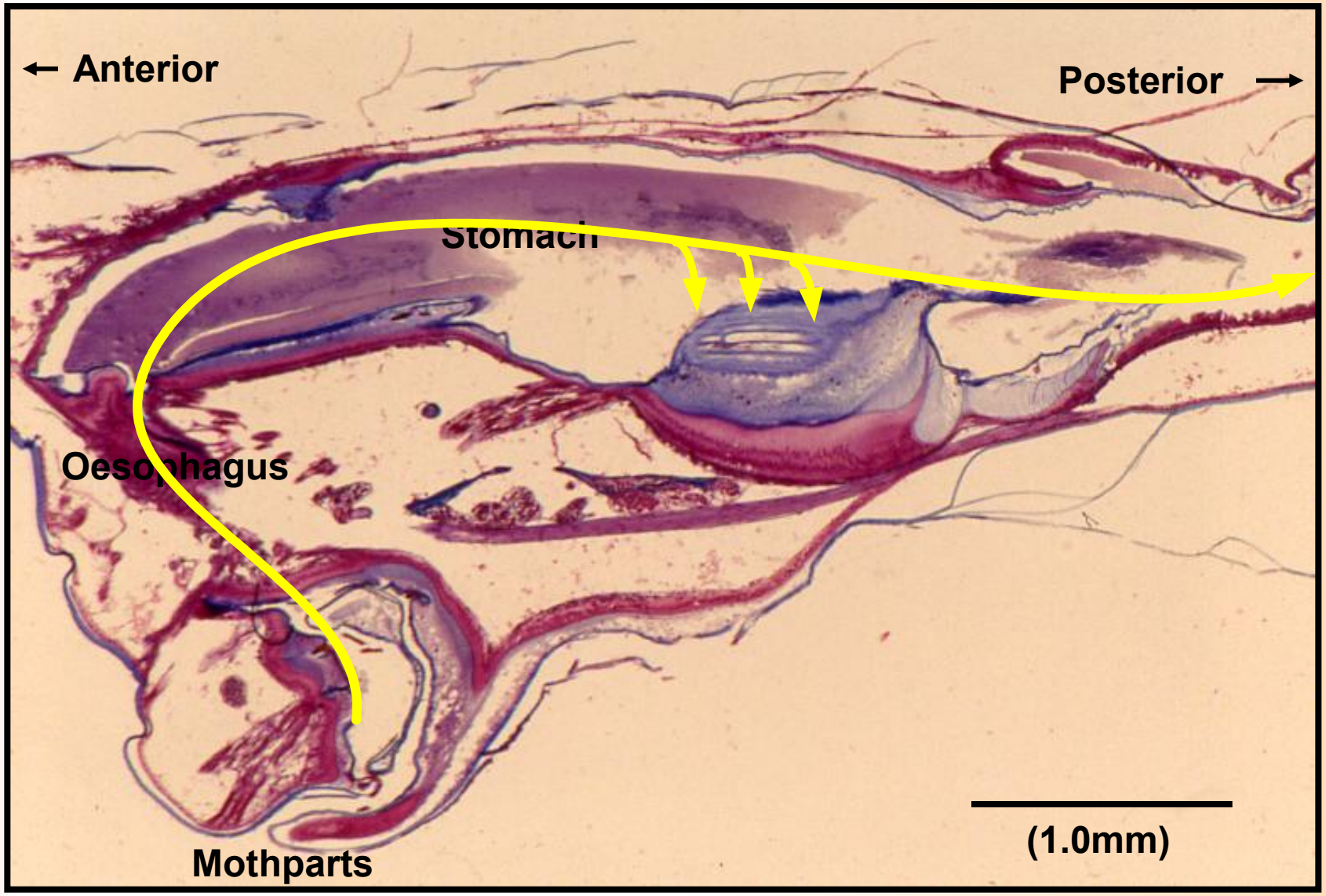
Sagittal section of the phyllosoma stomach



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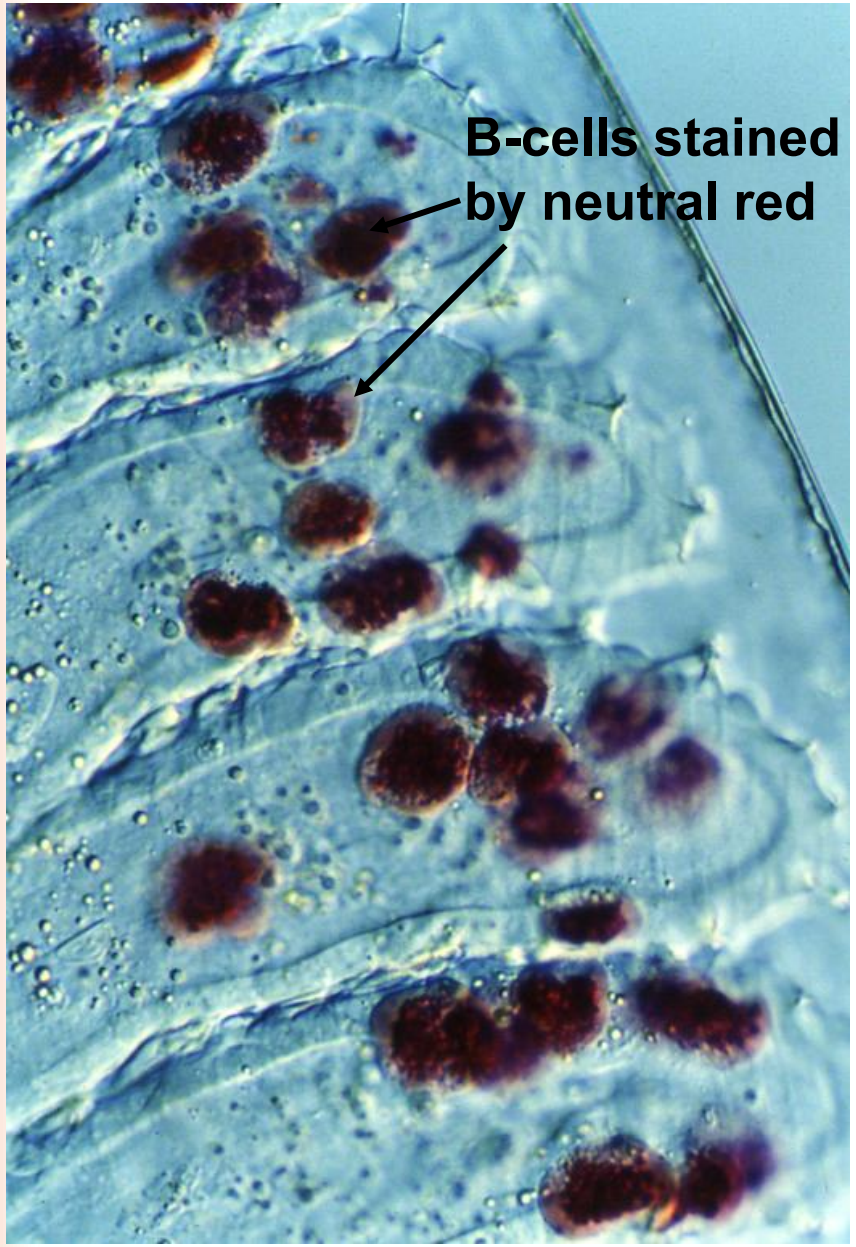
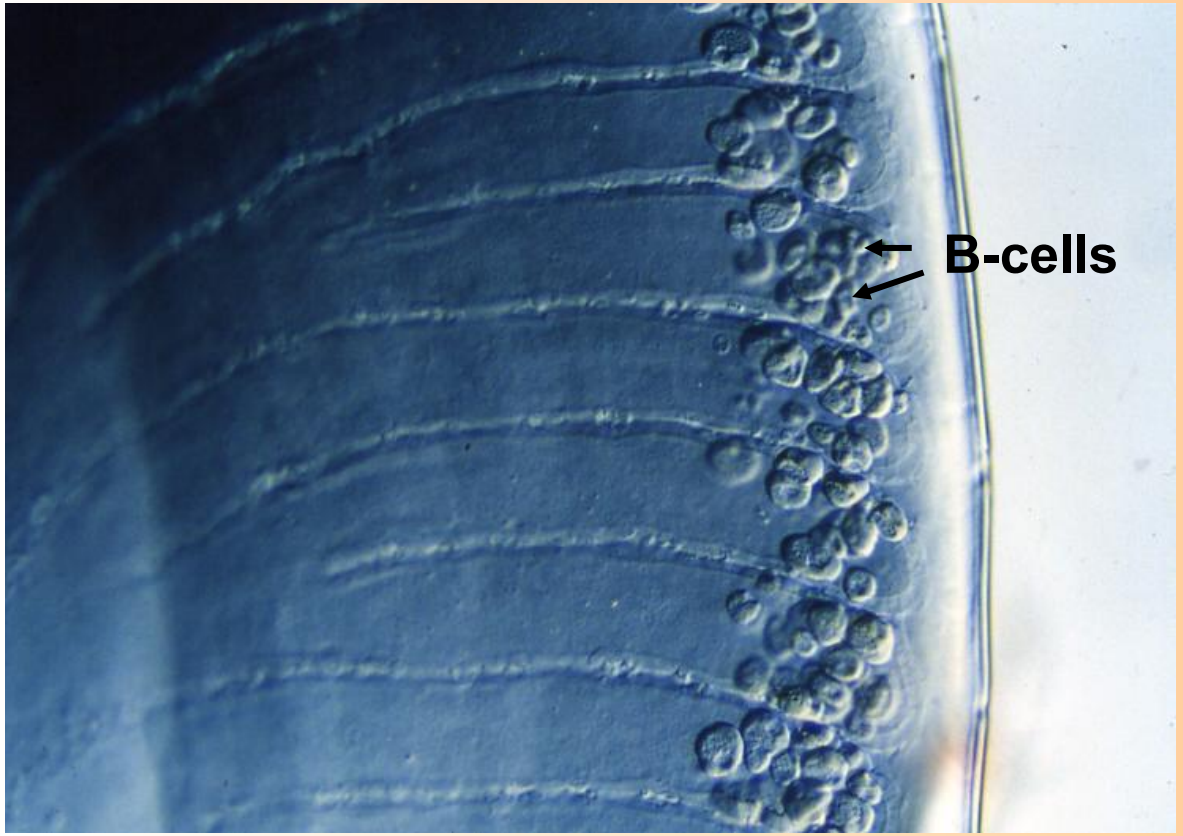
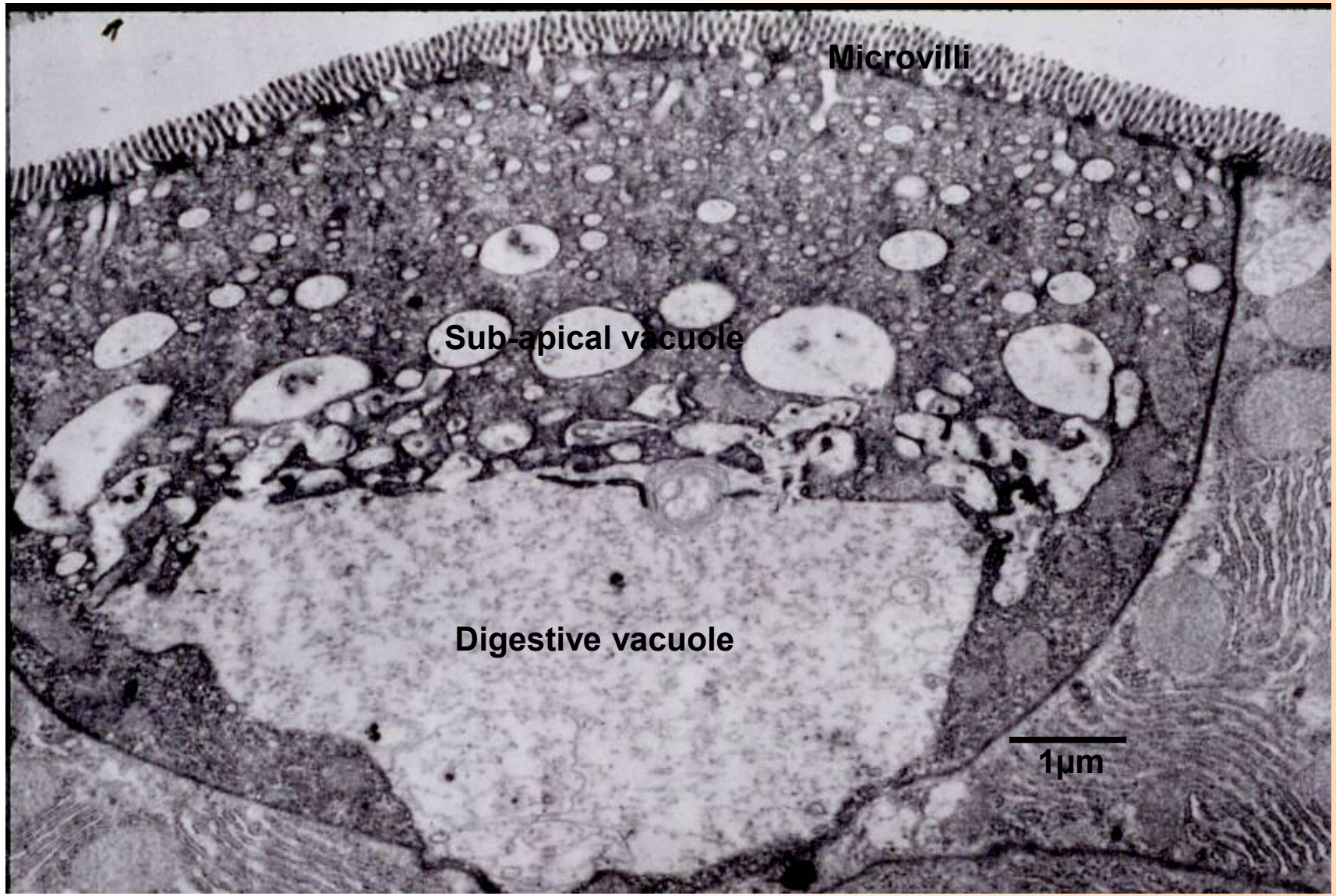
The midgut gland (B-cells) of the phyllosoma





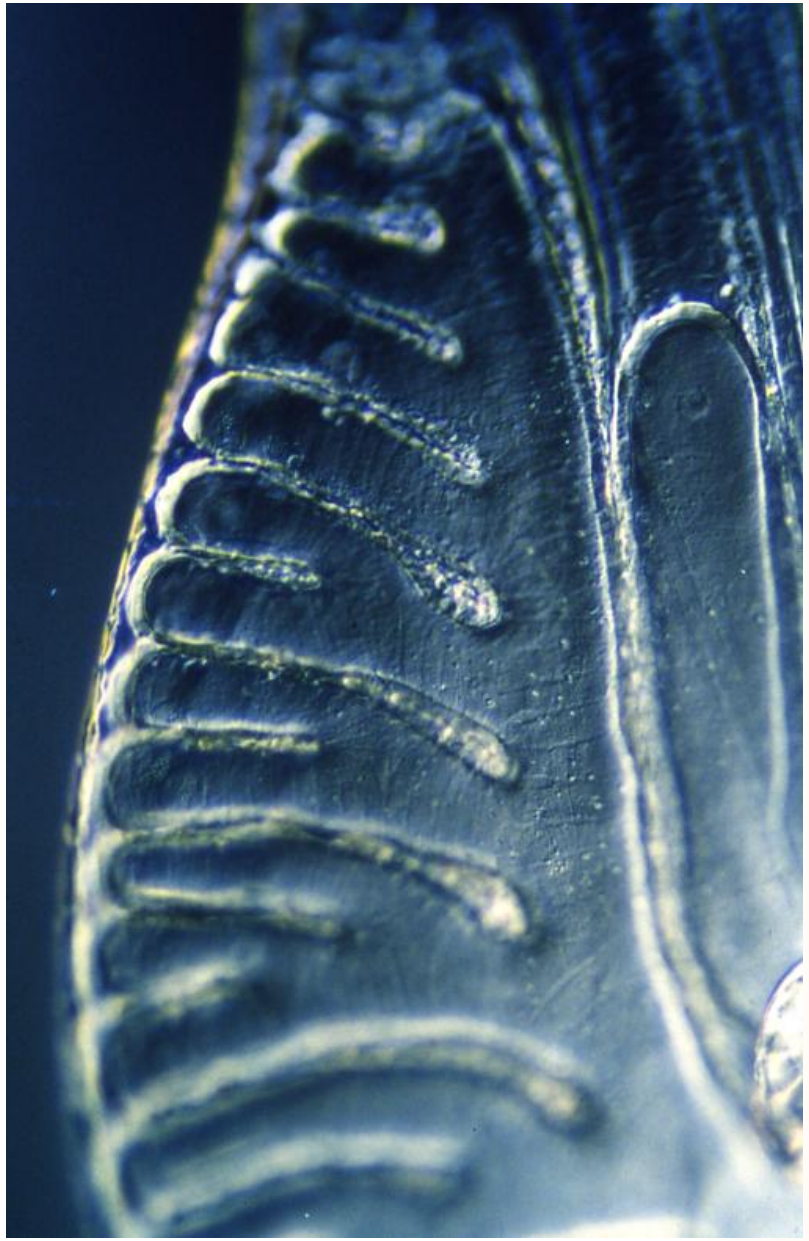
SCYLLA

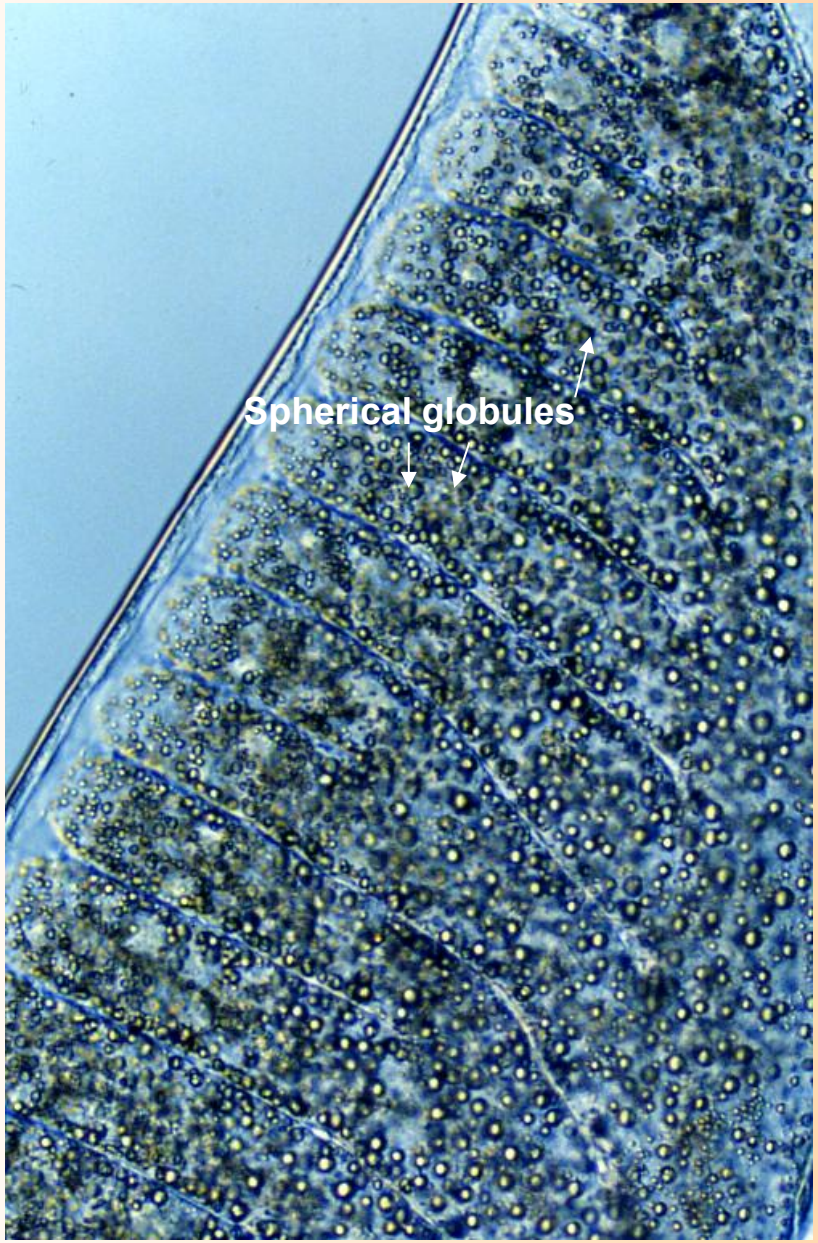
Ultrastructure of B-cells of the phyllosoma



SCYLLA

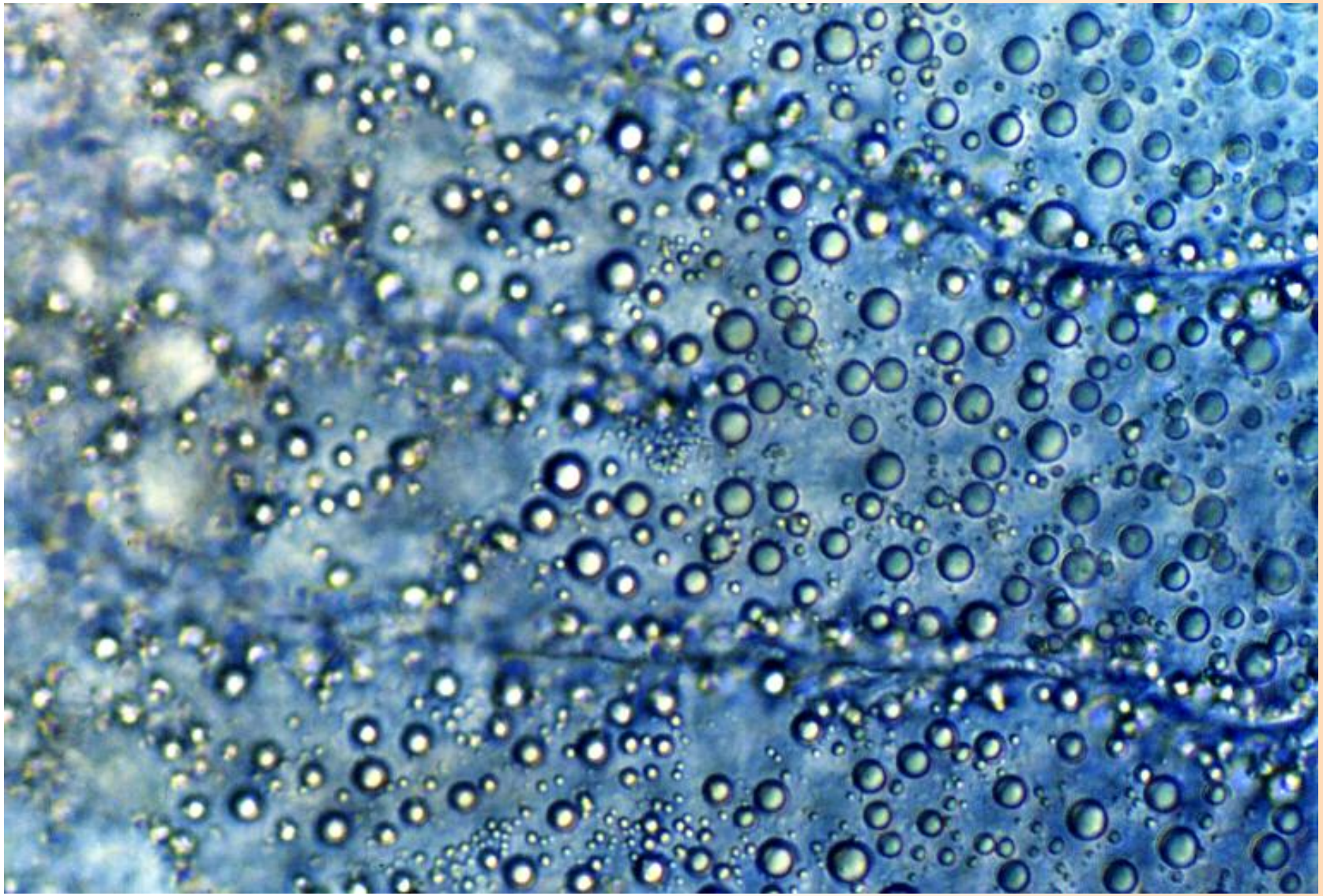
The midgut gland (R-cells) of the phyllosoma





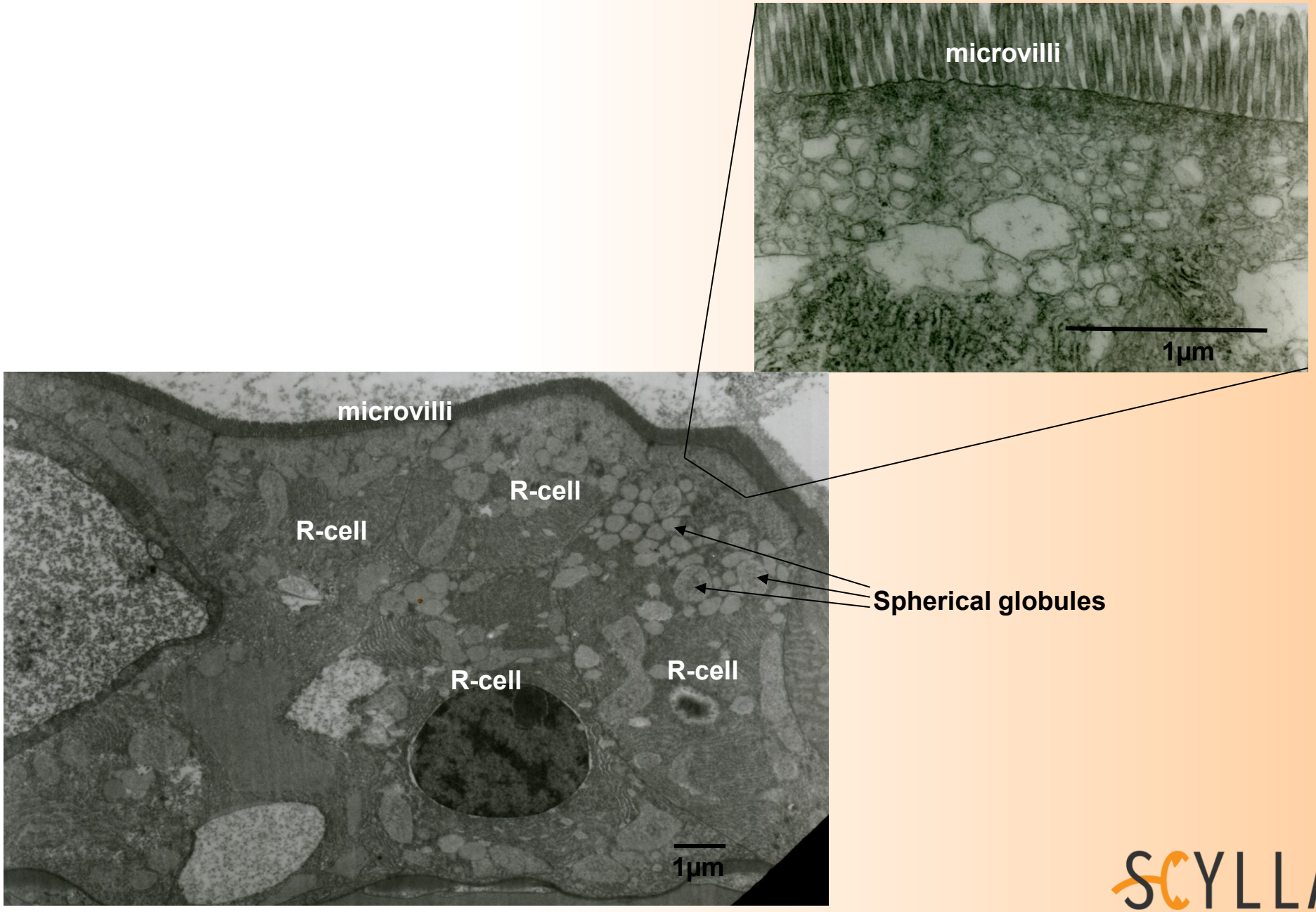
SCYLLA

The midgut gland (R-cells) of the phyllosoma



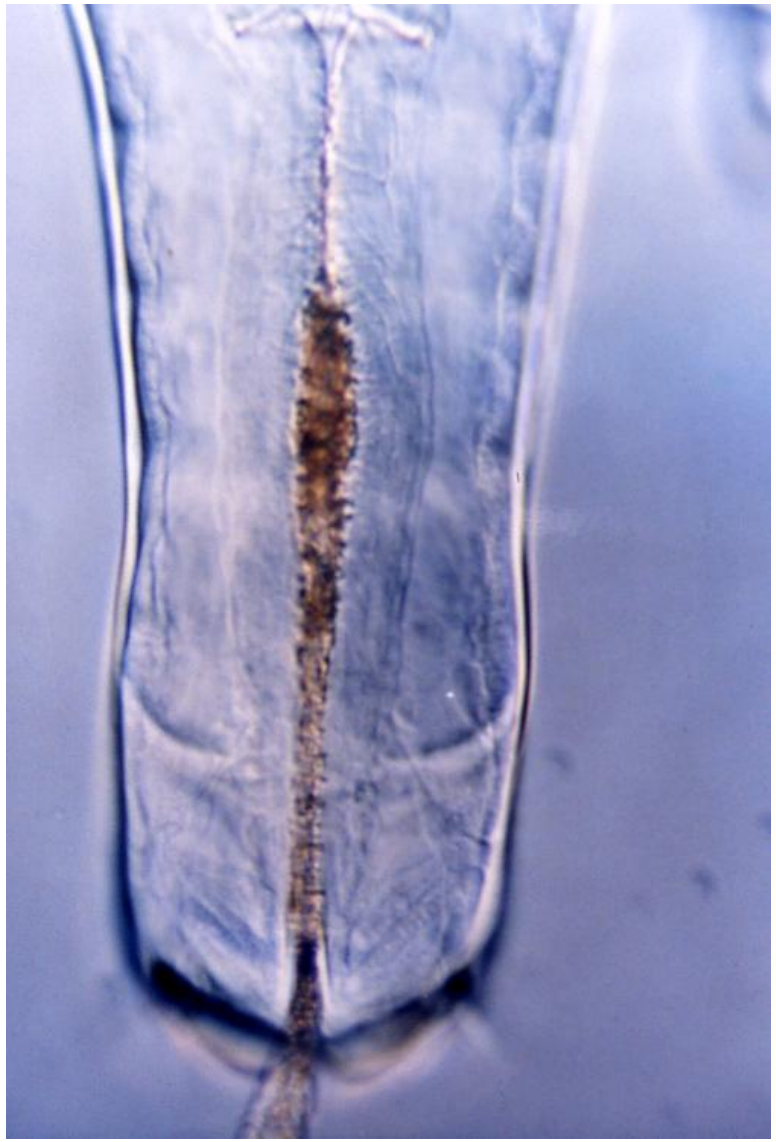
SCYLLA

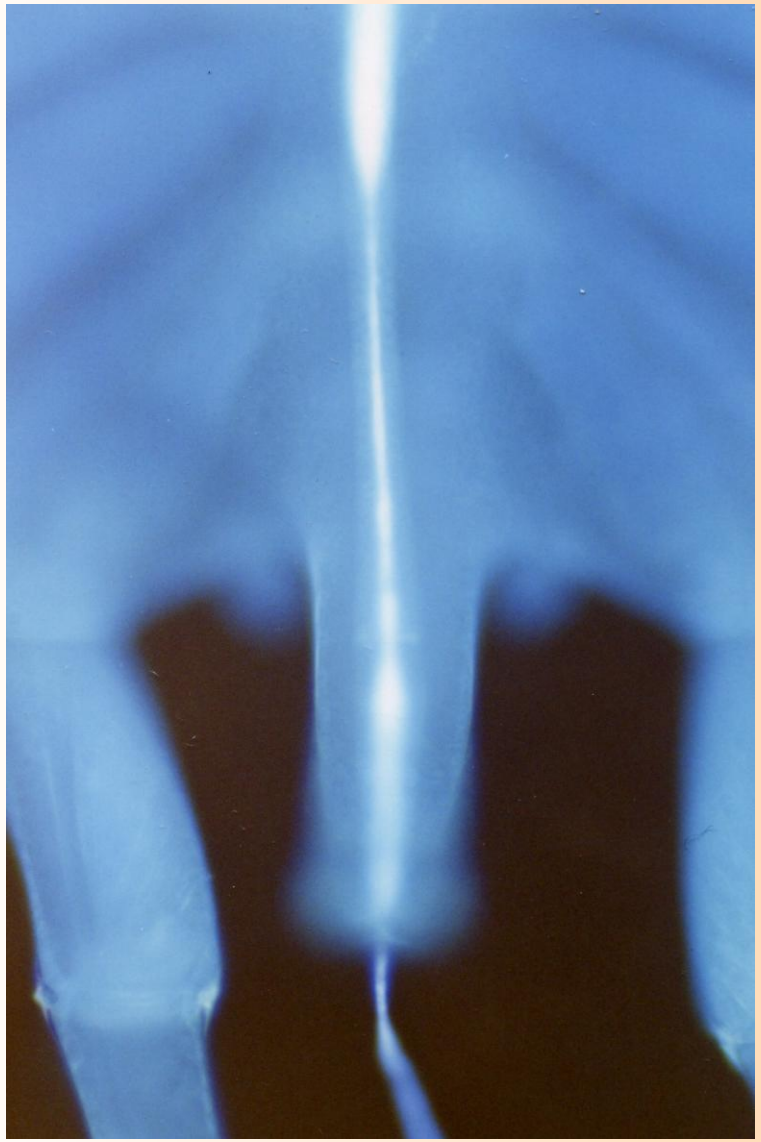
Ultrastructure of R-cells of the phyllosoma



SCYLLA

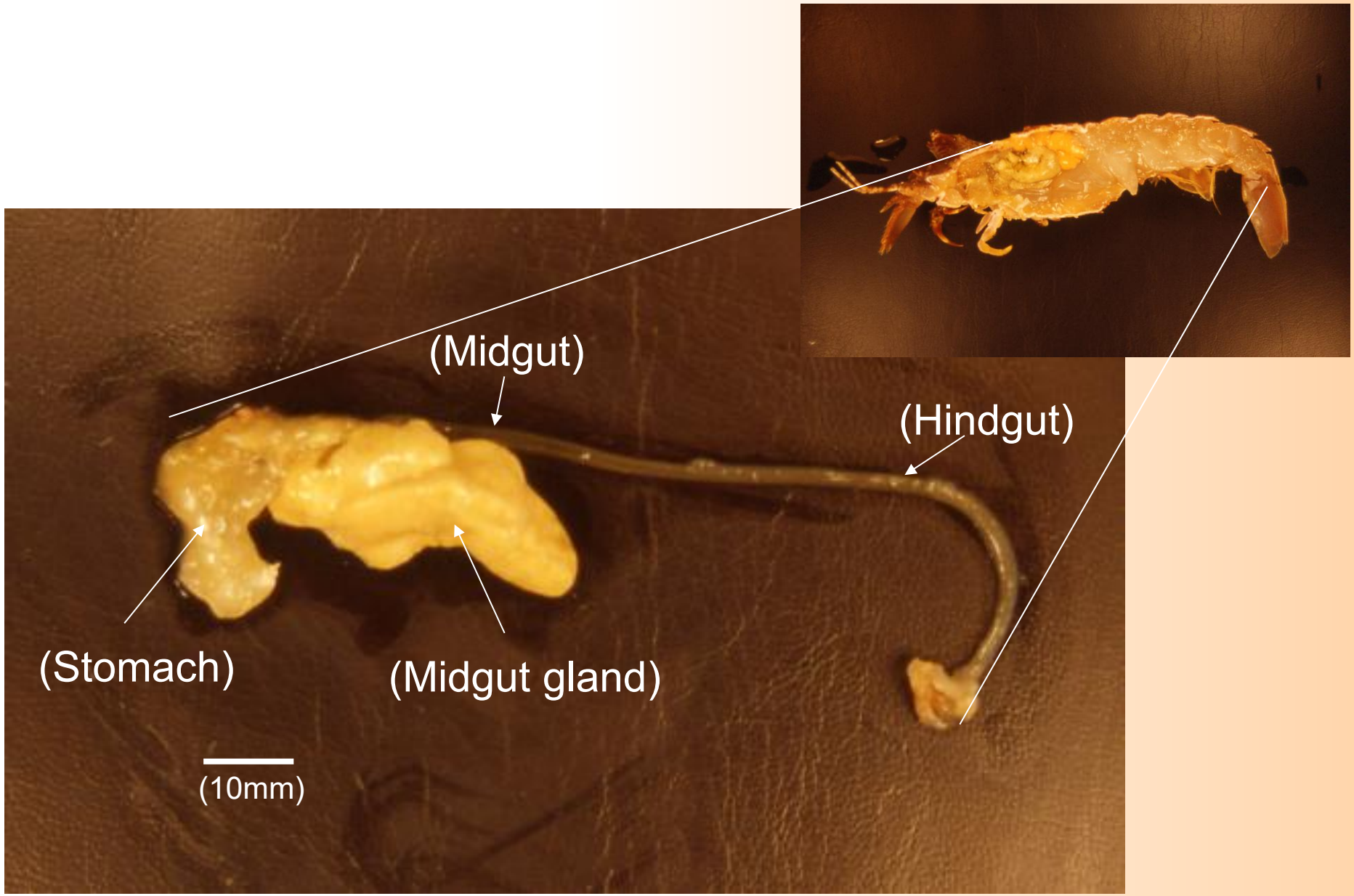
The hindgut of the phyllosoma





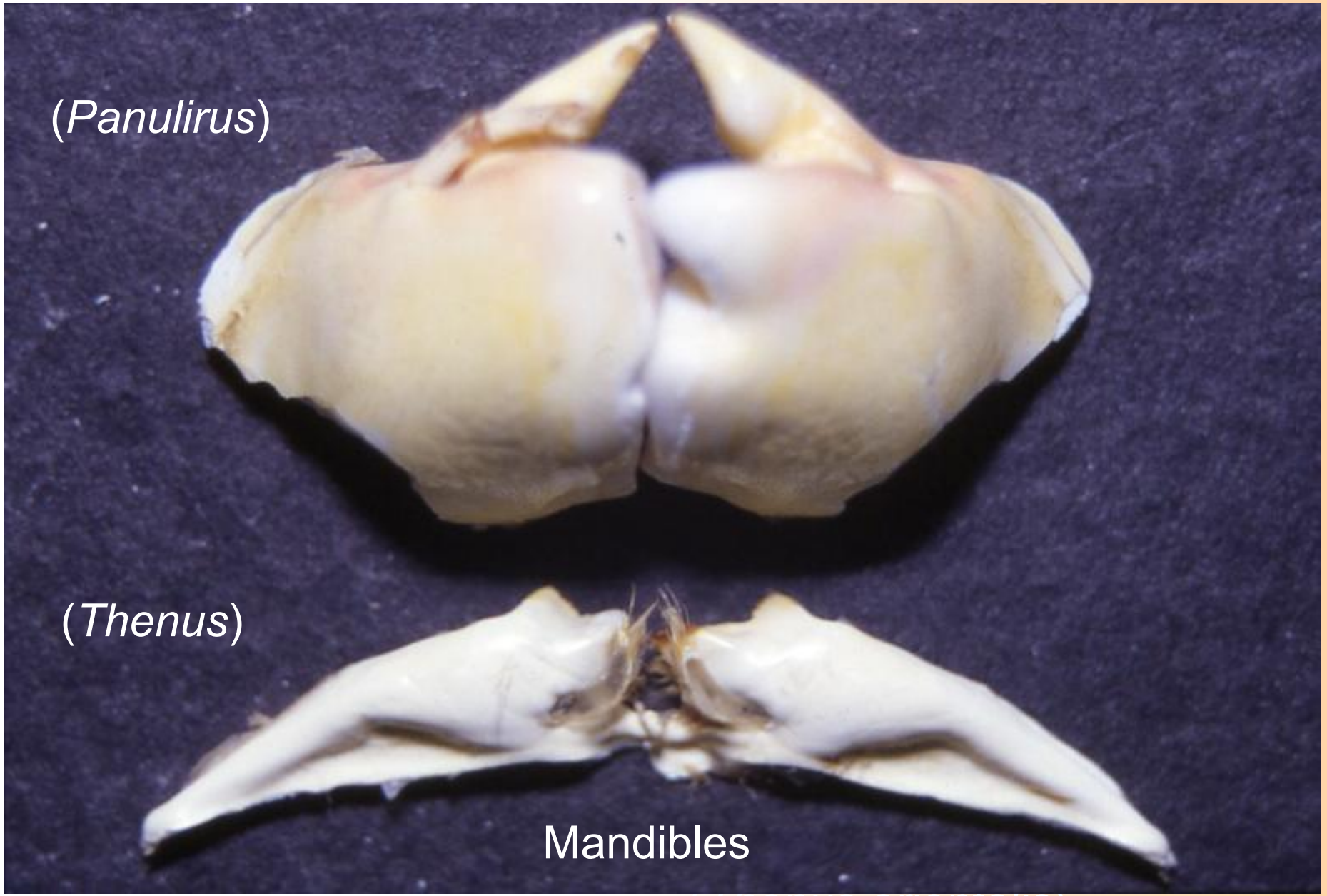
SCYLLA

Digestive system of the juvenile/adult lobster (*Thenus*)



SCYLLA

Comparison of mandibles (*Panulirus* vs *Thenus*)



(*Thenus orientalis*)

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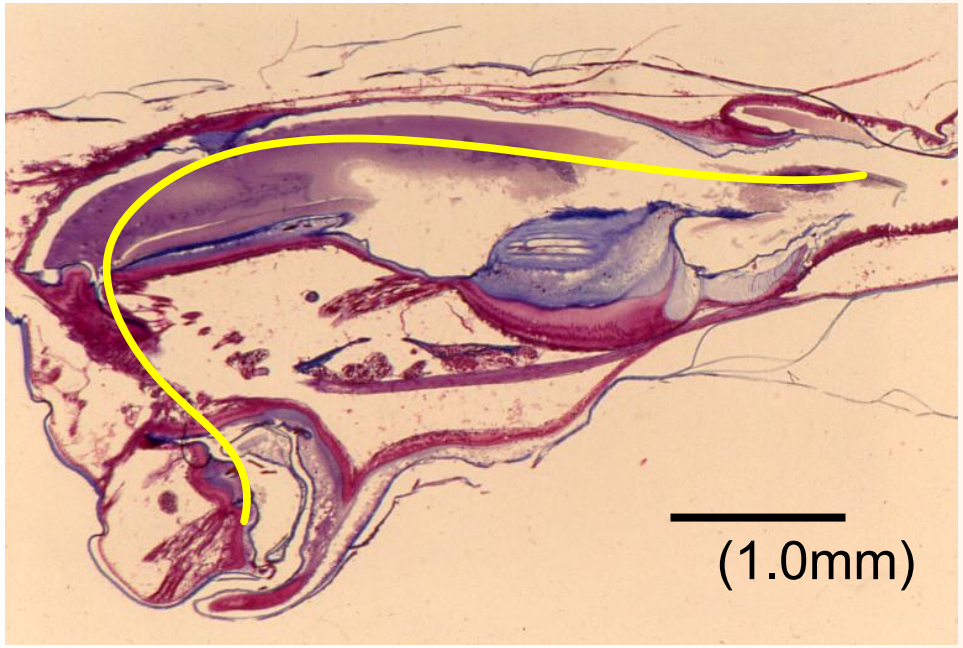
Sagittal section of the stomach



(Phyllosoma)

(Juvenile)

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Summary of digestive system

(Phyllosomas)

Required day/night continues feeding due to quick digestive cycle
Can only be fed on moist soft-bodied diets

(Nistos/Puerulus)

No feeding stage

(Juveniles/adults)

Only night-time feeding is required due to storage facility
Type of feed is depending on habitat, can be estimated by mouthparts

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Contents

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Pilot scale operation (R&D) at
Bribie Island Aquaculture Research Centre
Queensland, Australia

Three phases from pilot scale to full commercial operation

(Phase 1: Start with trials)

- Understanding of biological requirements
- Optimising nutritional requirements
- Establishment of methodology

(Phase 2: Set up goal)

- Establishment of target production level
- Biological feasibility
- Economical evaluation
- Market capacity

(Phase 3: Up-scaling of pilot trials)

- Full understanding of critical elements
- Contingency planning for these critical elements
- Long-term planning for future expansion

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Pilot scale operation (R&D) at
Bribie Island Aquaculture Research Centre
Queensland, Australia

1.2 litre glass bowl (finger bowl) for preliminary study

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Pilot scale operation (R&D) at Bribie Island Aquaculture Research Centre Queensland, Australia

380 litre prototype larval rearing tank

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Pilot scale operation (R&D) at Bribie Island Aquaculture Research Centre Queensland, Australia

1200 litre prototype larval rearing tank (Failed)

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Pilot scale operation (R&D) at Bribie Island Aquaculture Research Centre Queensland, Australia

300mm width prototype raceway (made from poly)

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Pilot scale operation (R&D) at Bribie Island Aquaculture Research Centre Queensland, Australia

Comparison between 300mm width raceway and 300m width “Dog-bone” raceway

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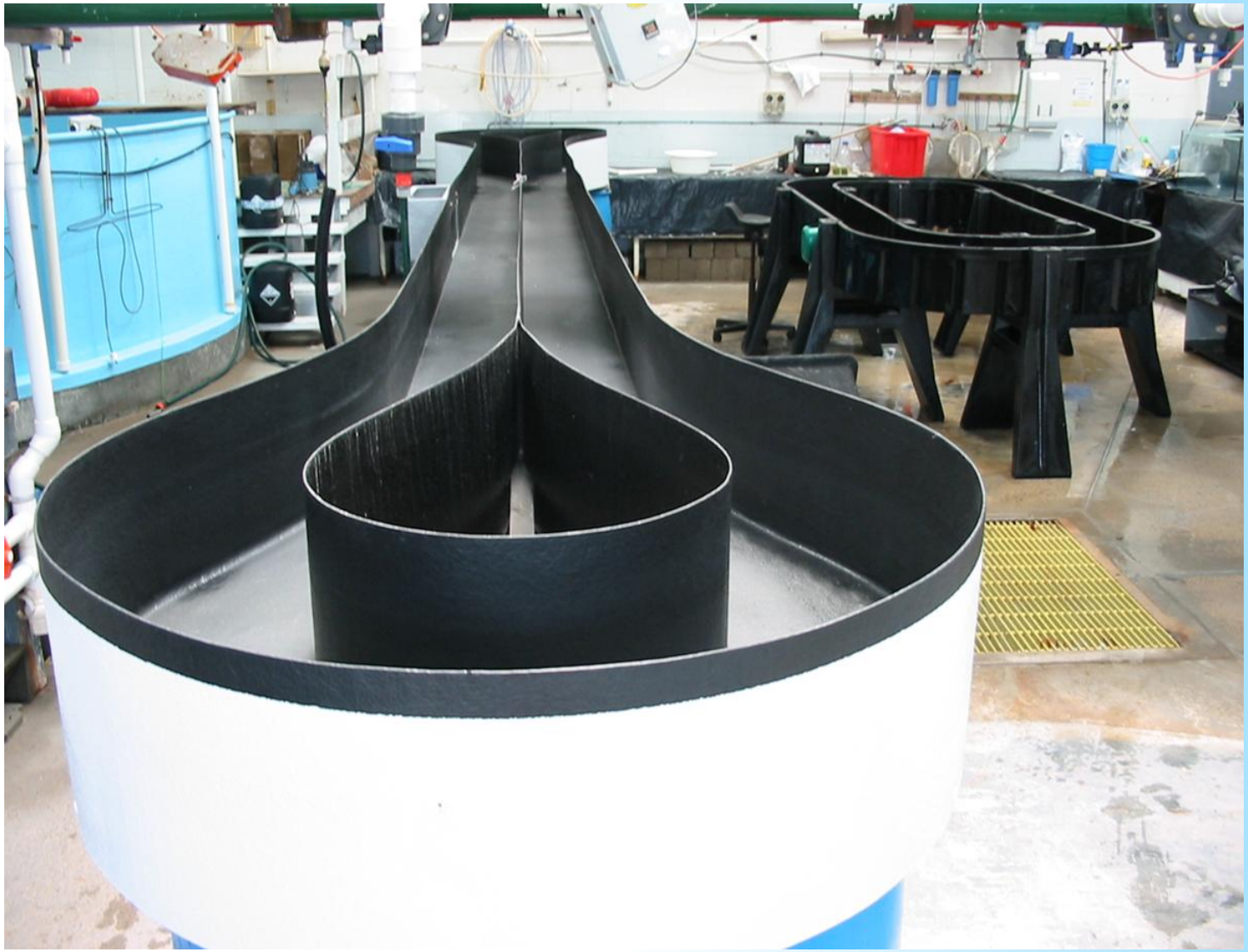
Pilot scale operation (R&D) at
Bribie Island Aquaculture Research Centre
Queensland, Australia



Comparison between 300mm width raceway and 300m width “Dog-bone” raceway

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Pilot scale operation (R&D) at
Bribie Island Aquaculture Research Centre
Queensland, Australia

Fourth instar phyllsomas of *Thenus* in raceway

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Pilot scale operation (R&D) at
Bribie Island Aquaculture Research Centre
Queensland, Australia

Stage 5 Juveniles of *Thenus*

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Pilot scale operation (R&D) at
Bribie Island Aquaculture Research Centre
Queensland, Australia

Juveniles of *Thenus* in 300mm width prototype raceway

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Pilot scale operation (R&D) at
Bribie Island Aquaculture Research Centre
Queensland, Australia

Growout size *Thenus* in 1100mm width prototype raceway

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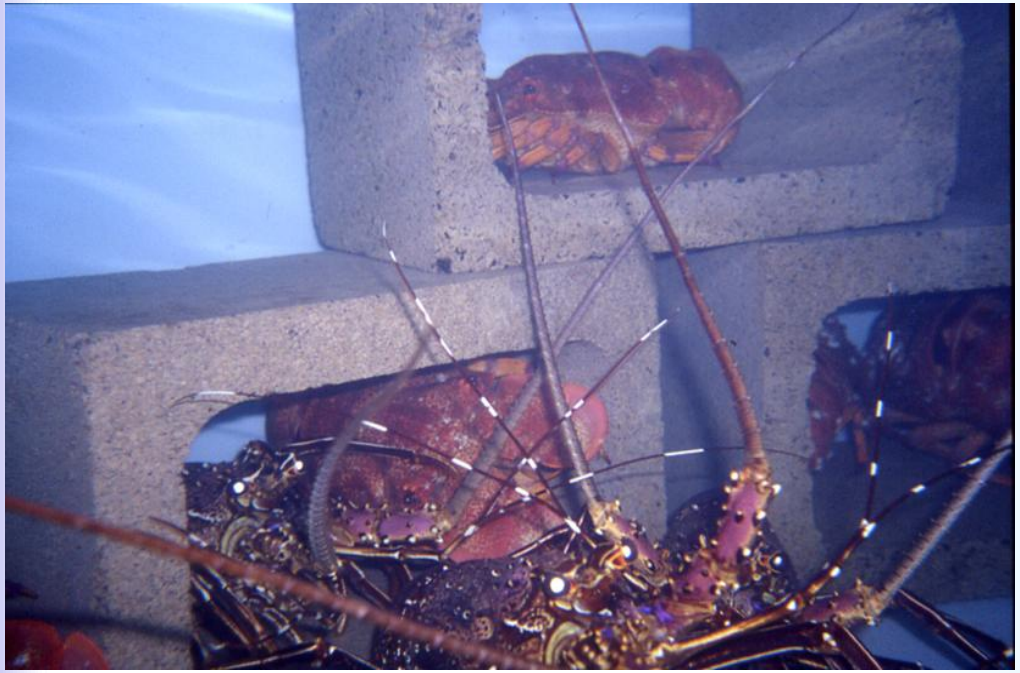
Pilot scale operation (R&D) at
Bribie Island Aquaculture Research Centre
Queensland, Australia



Rock lobster species

***Thenus* species**

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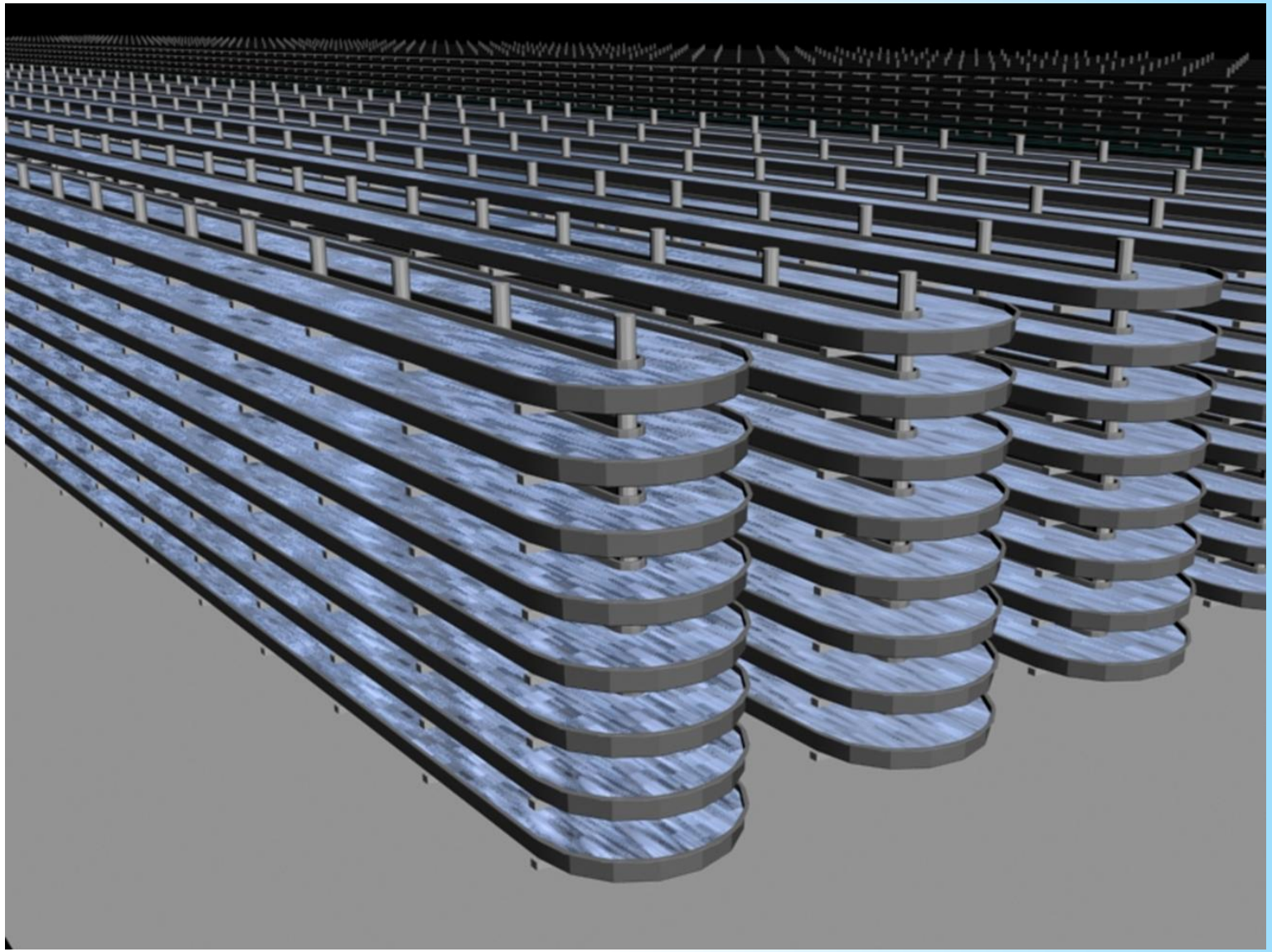
Pilot scale operation (R&D) at
Bribie Island Aquaculture Research Centre
Queensland, Australia



Concept image of stacked 1100mm raceway for grow-out size *Thenus*

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Australian Bay Lobster Producers (ABLP)

Goal (Tasks)

- Recirculation Aquaculture system (RAS)
  - Targeting “Soft-shell” products (45g)
    - Continuous (Daily) harvesting
  - Final products of 180kg (4000) per day

Tweed, Northern NSW, Australia

1.5ha (100m x 150m) glasshouse

4 Stages (1.5ha x 4)

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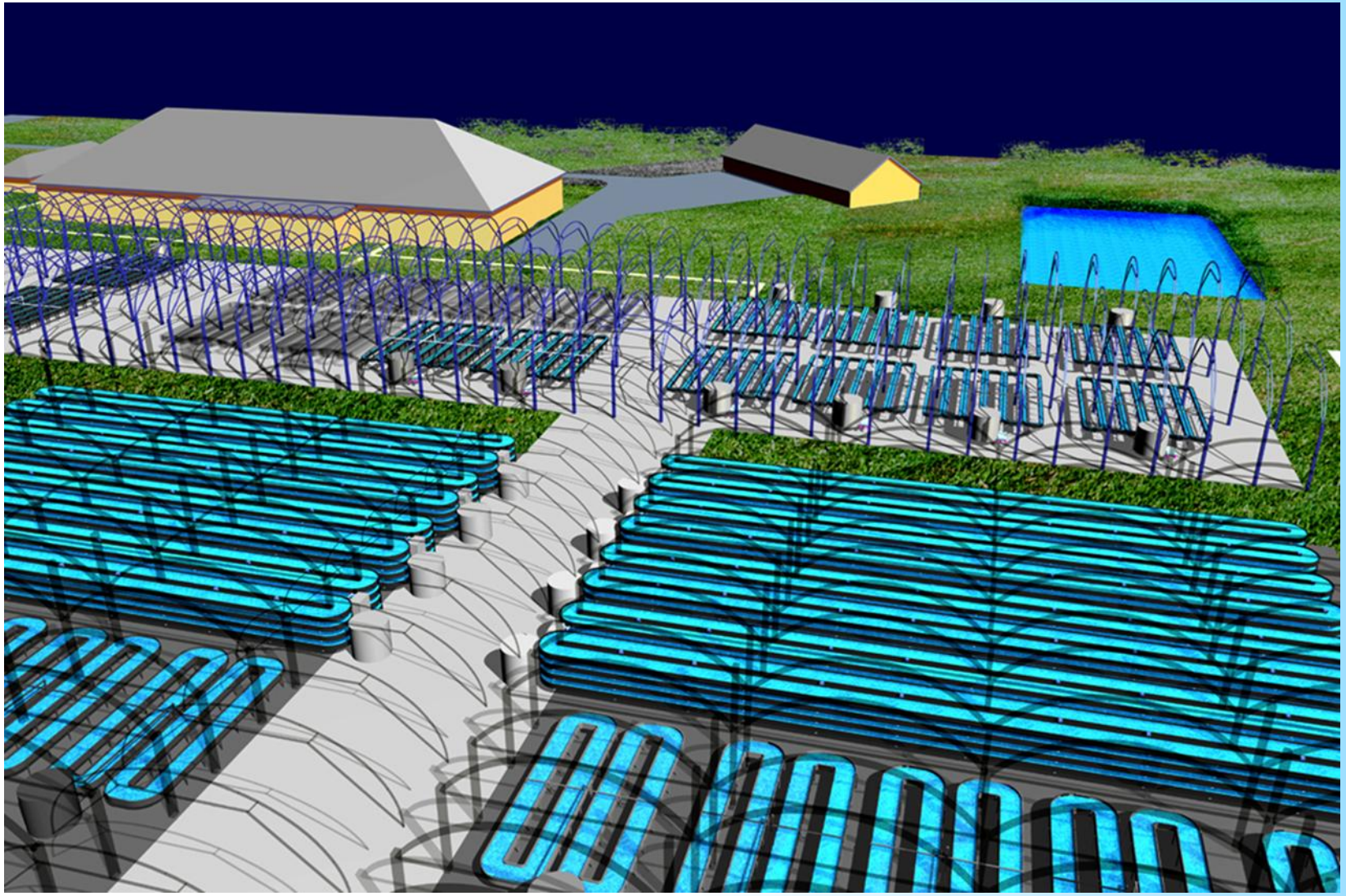
Australian Bay Lobster Producers (ABLP)



Concept image of ABLP facility at Northern NSW

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Australian Bay Lobster Producers (ABLP)

Overview of ABLP facility (the glasshouse)

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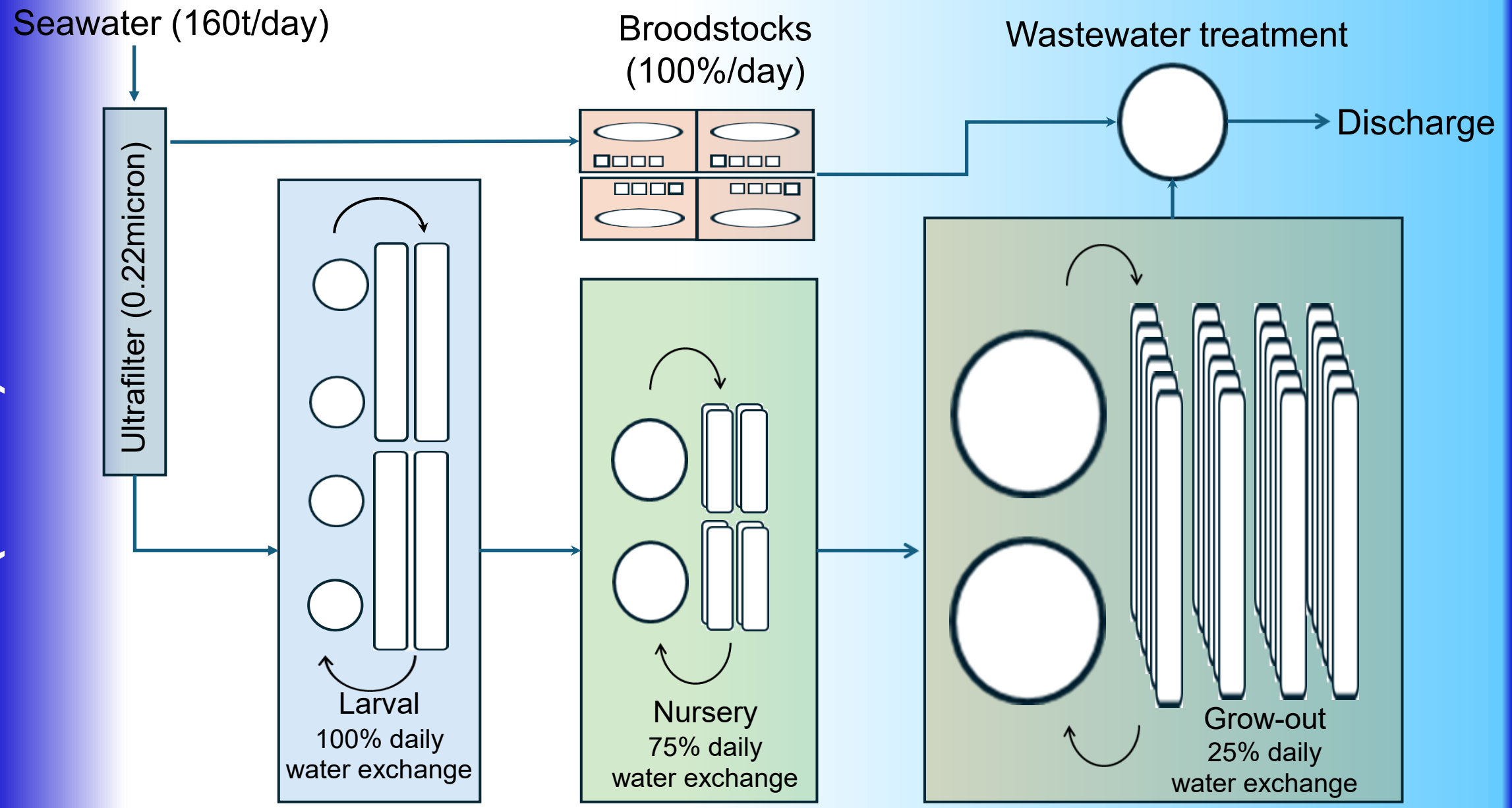
Australian Bay Lobster Producers (ABLP)



Simple diagram of ABLP facility (water movement)

Australian Bay Lobster Producers (ABLP)

Water storage

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Australian Bay Lobster Producers (ABLP)

Ultrafilter (0.22 micron)

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Australian Bay Lobster Producers (ABLP)

Quinidine and Broodstocks

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Australian Bay Lobster Producers (ABLP)

Larval rearing area

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Australian Bay Lobster Producers (ABLP)

Growout

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Contents

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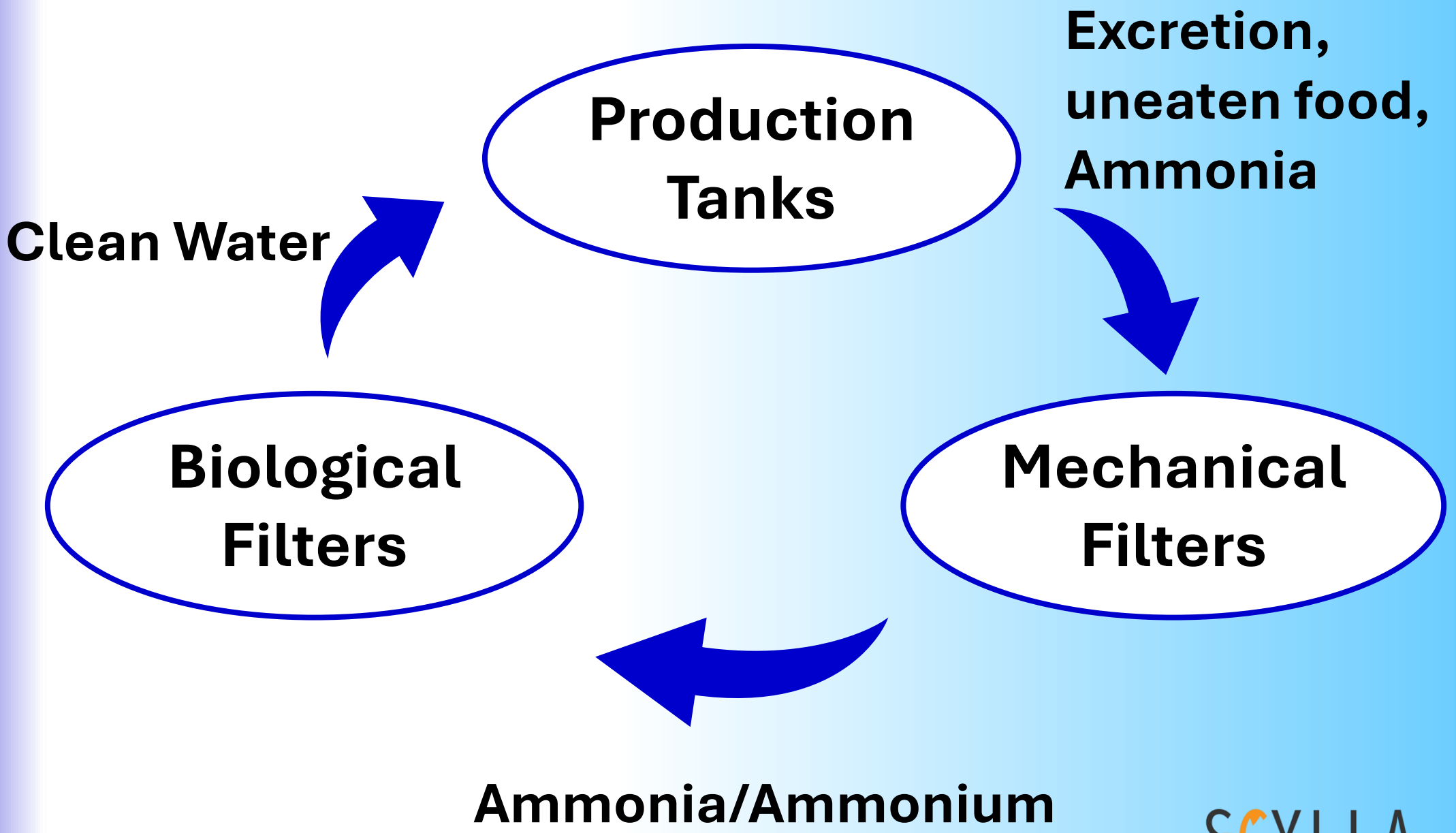
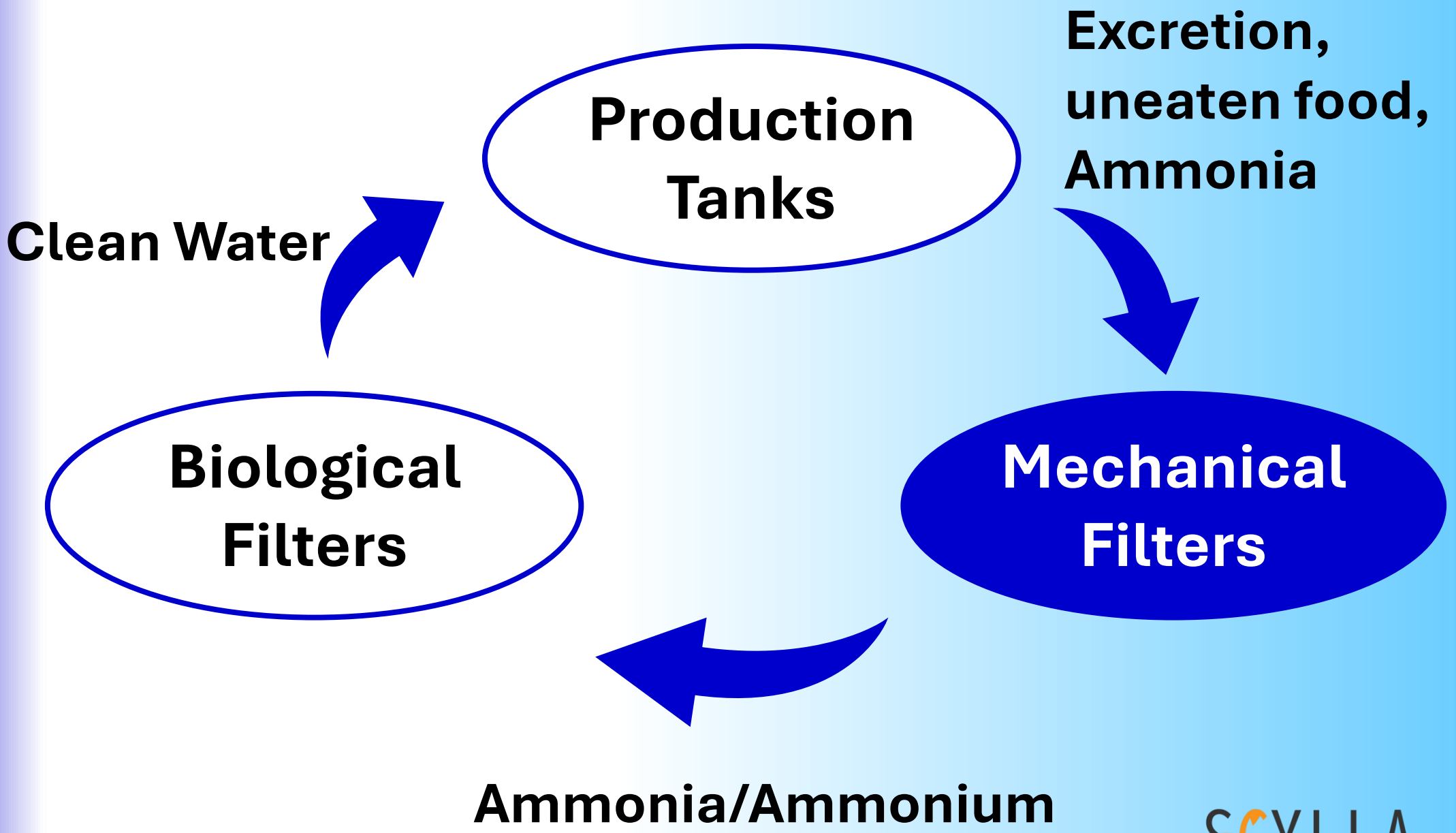
Simple diagram of water treatment



SCYLLA

Simple diagram of water treatment



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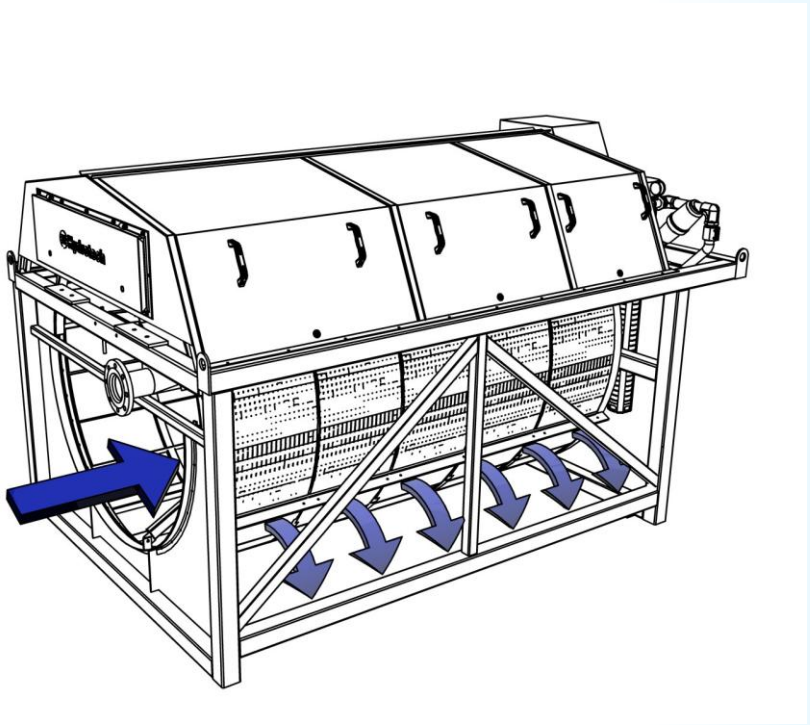
Example of mechanical filters



(Rotating drum filters)

(Multimedia filter)

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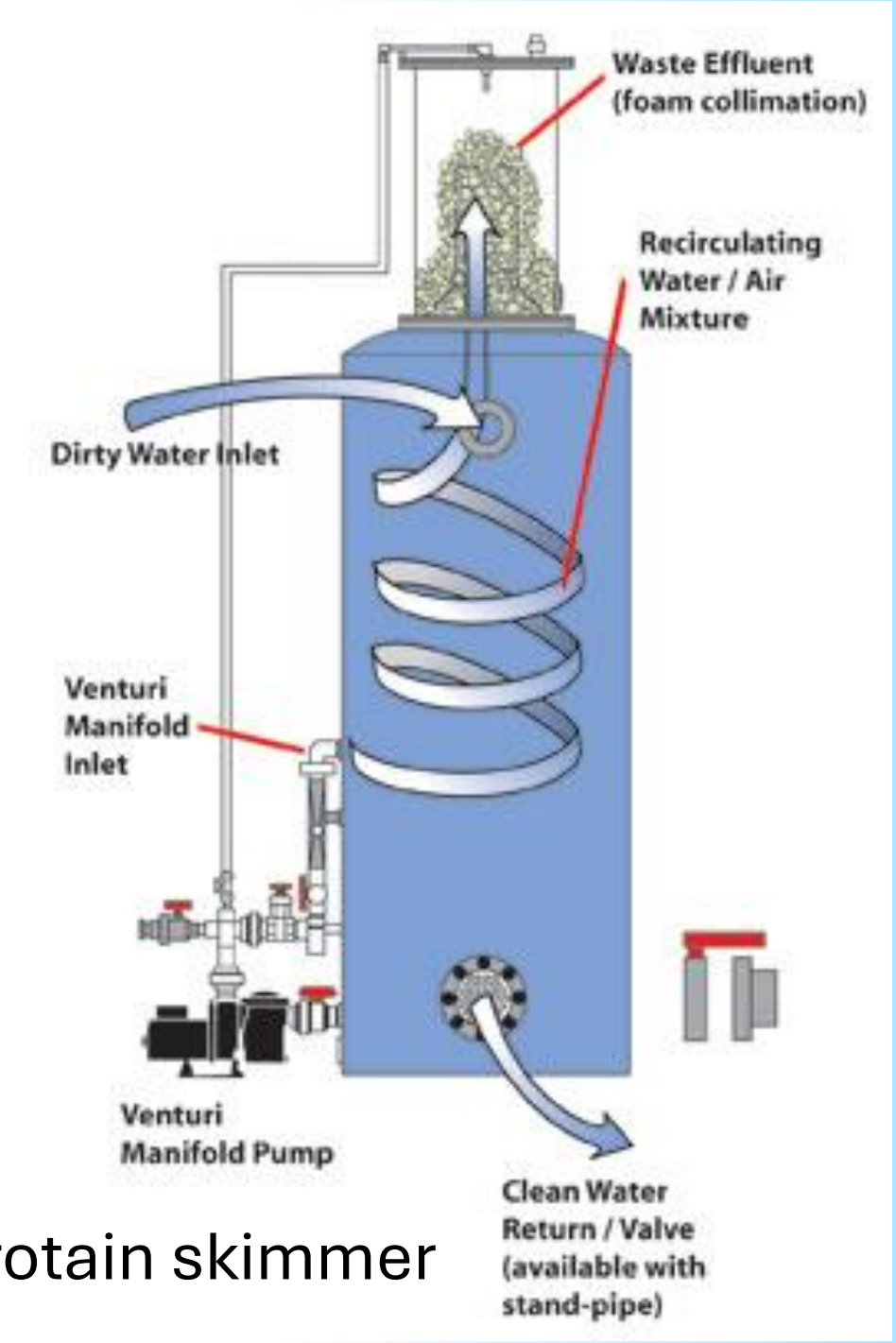
Removing suspended solid



Protain skimmer

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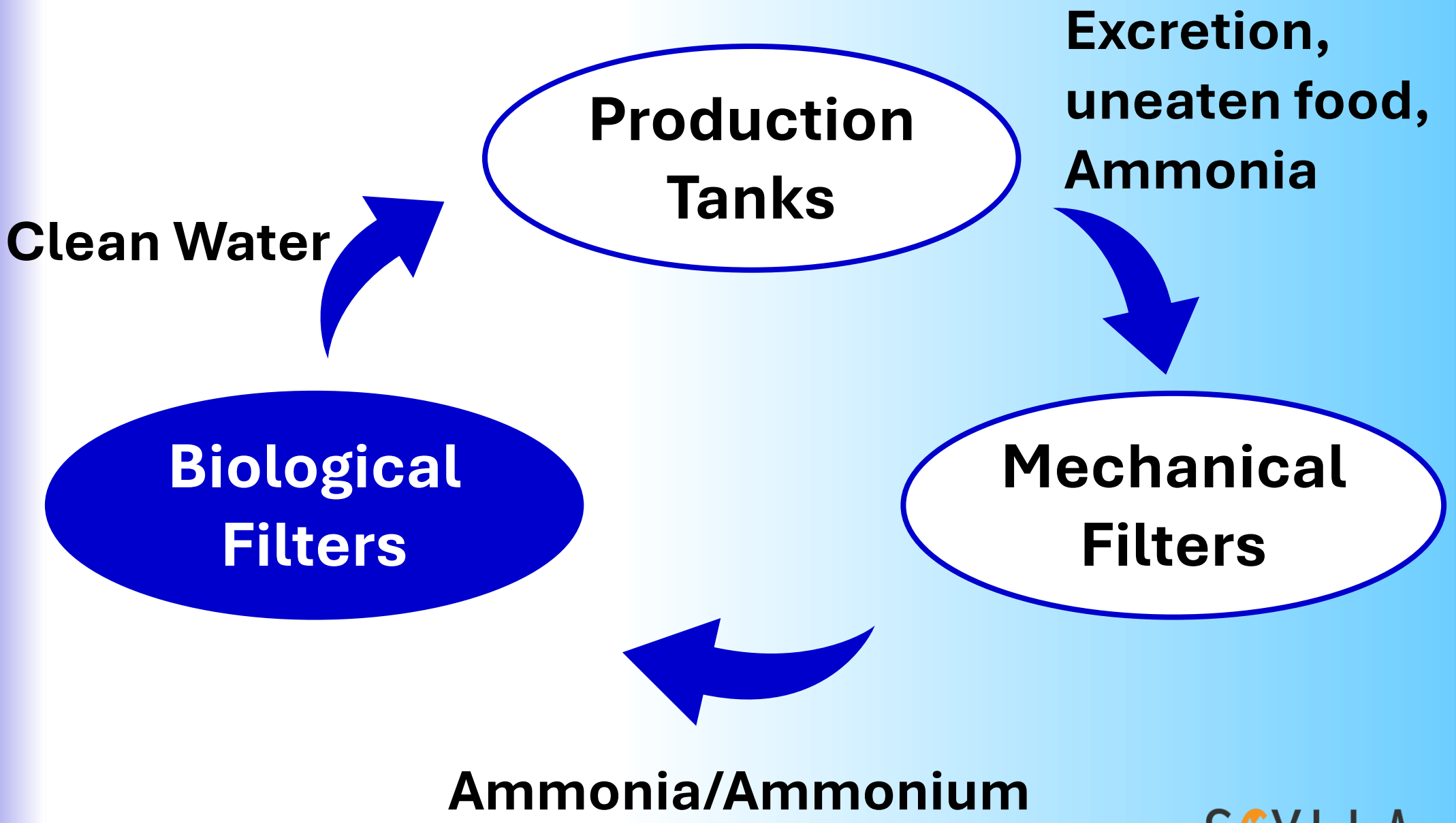
Simple diagram of water treatment



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Nitrification

(Step 1)

$$NH_4^+ \text{ (Ammonium)} + 1.5O_2 \xrightarrow{\textit{Nitrosomonas}} NO_2^- \text{ (Nitrate)} + 2H^+ + H_2O$$

(Step 2)

$$No_2^- \text{ (Nitrite)} + 0.5O_2 \xrightarrow{\textit{Nitrobacter}} NO_3^- \text{ (Nitrate)} + 2H^+ + H^2O$$

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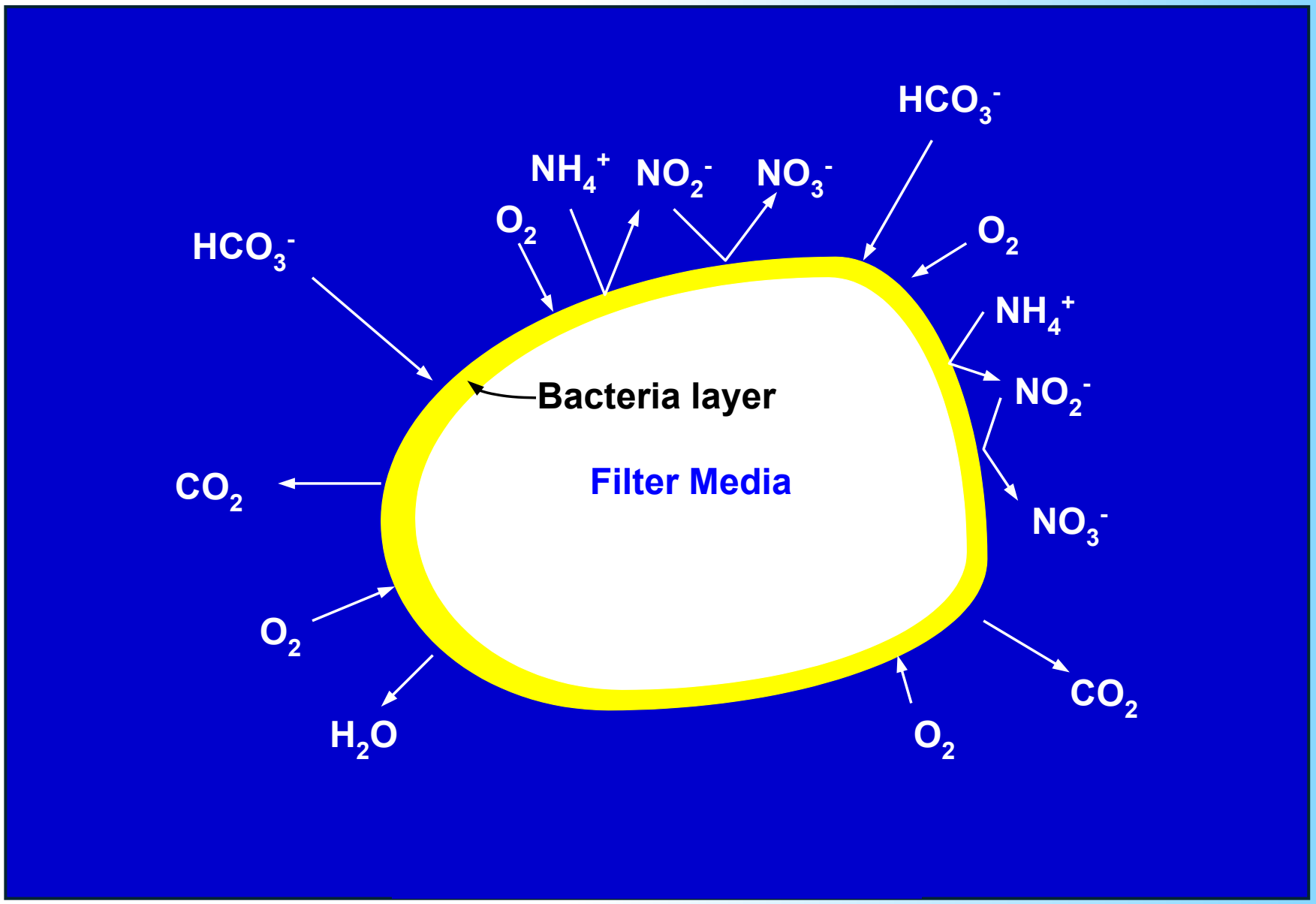
Nitrification model



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Biological filter

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Pros & Cons of RAS

Pros

- Less water access
- Environmental Control
- Location
- Biosecurity

Cons

- High energy costs
- Technical complexity
- System imbalance
- Limited Species

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Future potential of RAS

Are RAS a key part of future Aquaculture?

Yes, but....

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Contents

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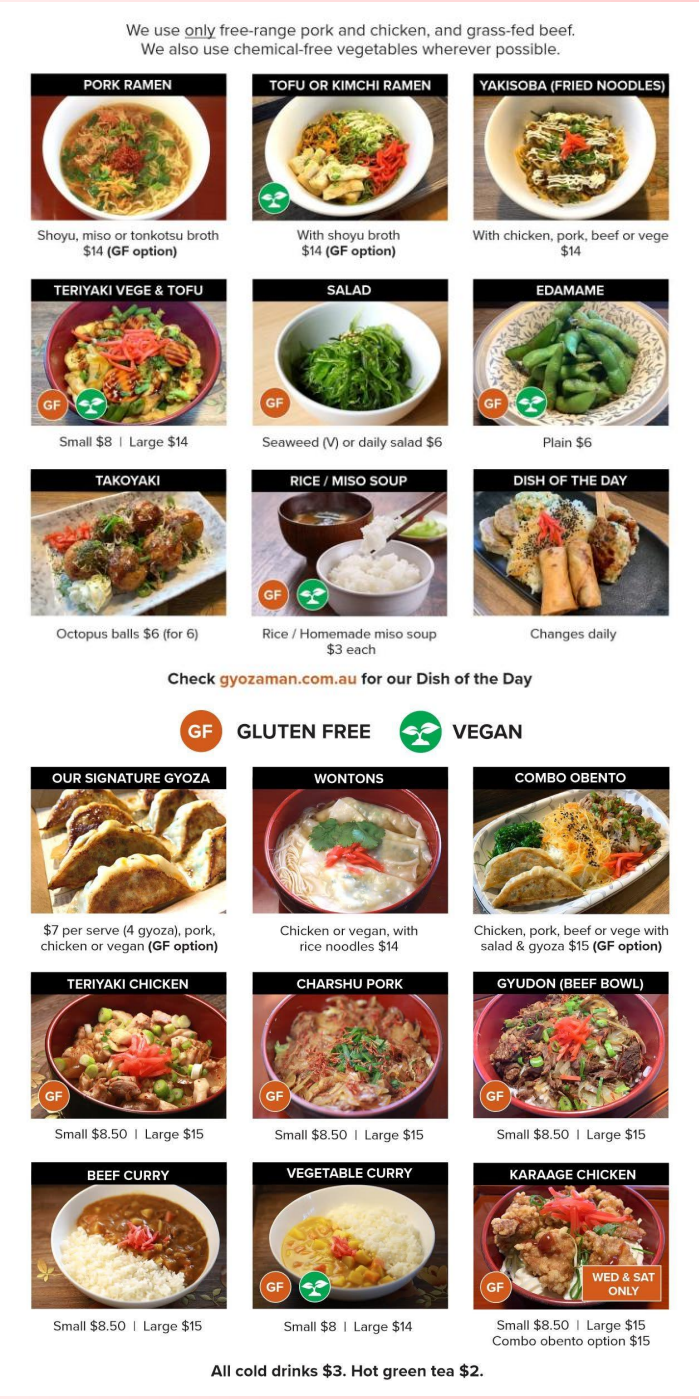
Gyoza Man Japanese Takeaway

- Small Japanese food Takeaway shop
- Opened at May 2020
- Closed in November 2024
- 4.8 Google Review (129)



Dish of Day

- Seafood Tuesday
- Karaage Wednesday
- Request Thursday
- Deep-Friday
- Karaage Saturday

Gyoza Man
Japanese Takeaway

Gyoza: No “Gyo” sound: Ga-Yoo-Za

Tenpura: No “Pu” sound: Tem-Pyu-Ra

Okonomiyaki: = O-Ko-No-Mi-Ya-Ki (5 syllables)

Chikuzeni: Chi-Ku-Zen-Ni

Ton-ko-Tsu: Tsu=Su=Zu: Ton-ka-Tsu

Karaage: Kara-Age

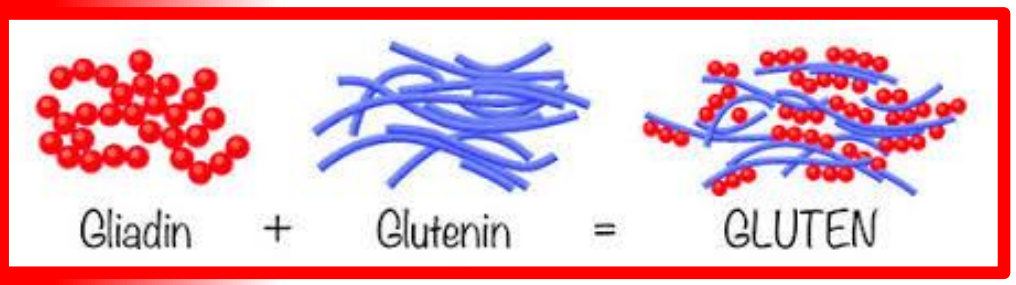
Spoon=Liquid (Soup)

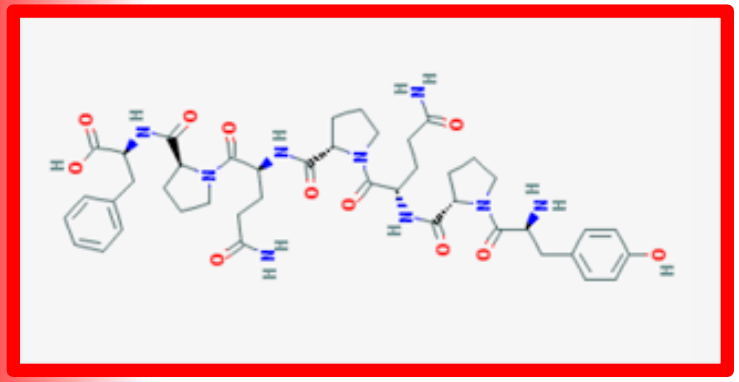
GF = Gluten Free

GF GLUTEN FREE VEGAN

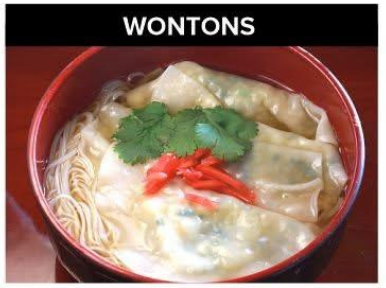
Gluten

- A protein found in certain grains
  - (Like wheat, barley and rye)
    - Acting as a binder





$7 per serve (4 gyoza), pork, chicken or vegan **(GF option)**



Chicken or vegan, with rice noodles $14

Chicken, pork, beef or vege with salad & gyoza $15 **(GF option)**

Small $8.50 | Large $15

Small $8.50 | Large $15

Small $8.50 | Large $15

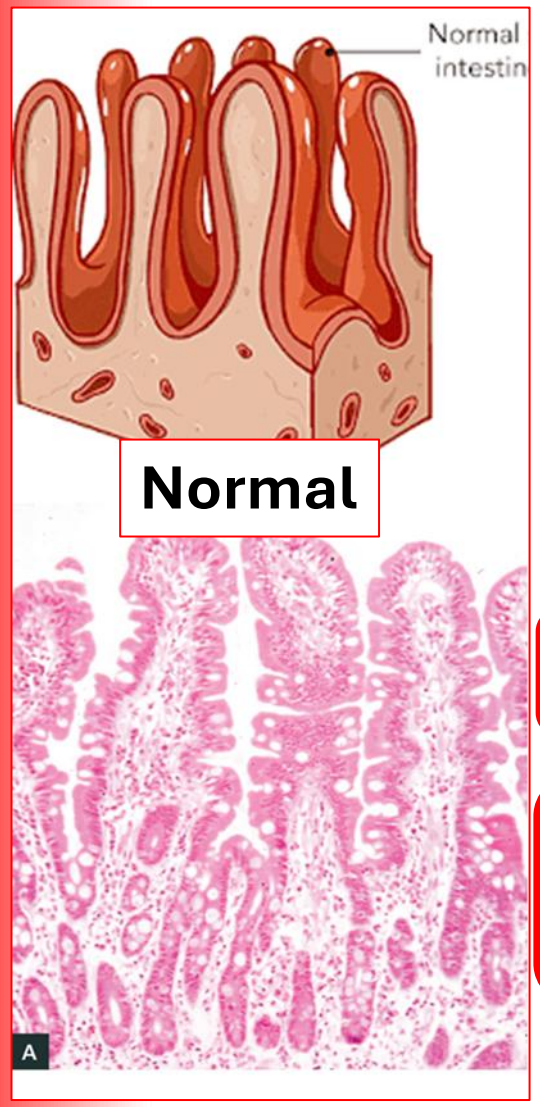
Small $8.50 | Large $15

Small $8 | Large $14

Small $8.50 | Large $15
Combo obento option $15

All cold drinks $3. Hot green tea $2.

Coeliac disease



Normal

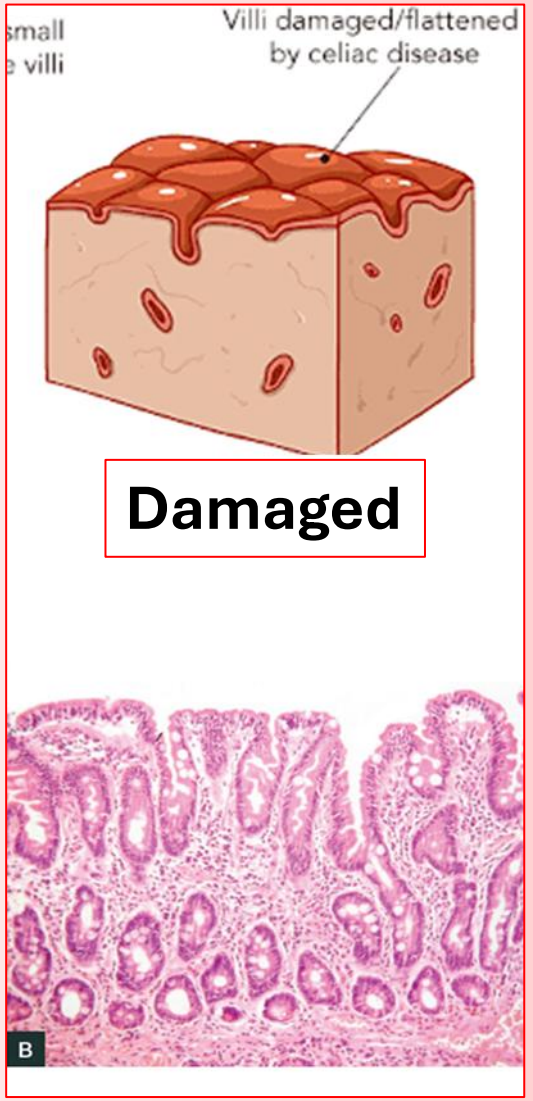
A chronic digestive disorder

An autoimmune disease

Triggered by gluten

Damages the small intestine

Preventing nutrient absorption



Damaged

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Coeliac Disseise (Genetics)

HLA-DQA1 Gene

HLA-DQB1 Gene

Worldwide population of around 30-40%

Affect 1% worldwide population

Coeliac

Only about 30% are properly diagnosed

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Celiac disease among Japanese

Genetic Factors

The low incidence is attributed to differences in the human leukocyte antigen (HLA) genes

Western countries	Japanese
1%	0.19%

Dietary Factors

Japanese diets traditionally feature less wheat compared to Western diets

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Is celiac disease preventable?

GLUTEN FREE

GLUTEN FREE

NO!

Strict to Gluten-Free Diet
Importance of Label Reading
Avoid Cross-Contamination
Emergency Treatment (Glutenase)

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Summary of Coeliac disseise

Triggered by Gluten

Not allergy

Autoimmune disorder

Coeliac

Triggered by external factors

Not all genetic carriers

May increase Japanese patients due to change of lifestyle

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Contents

Cooking is science?

AI Overview

Yes

Cooking is a science, specifically an applied science, involving chemistry, physics, and biology to transform ingredients into palatable and safe food.

- Chemical Reactions
- Physical Changes
- Disciplines Involved
- Molecular Gastronomy

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Cooking is art?

AI Overview

Yes

Cooking can be considered an art, as it involves creativity, skill, and a personal touch

Creativity and Expression

Skill and Technique

Personal Touch

Culinary Arts

The Art of Plating

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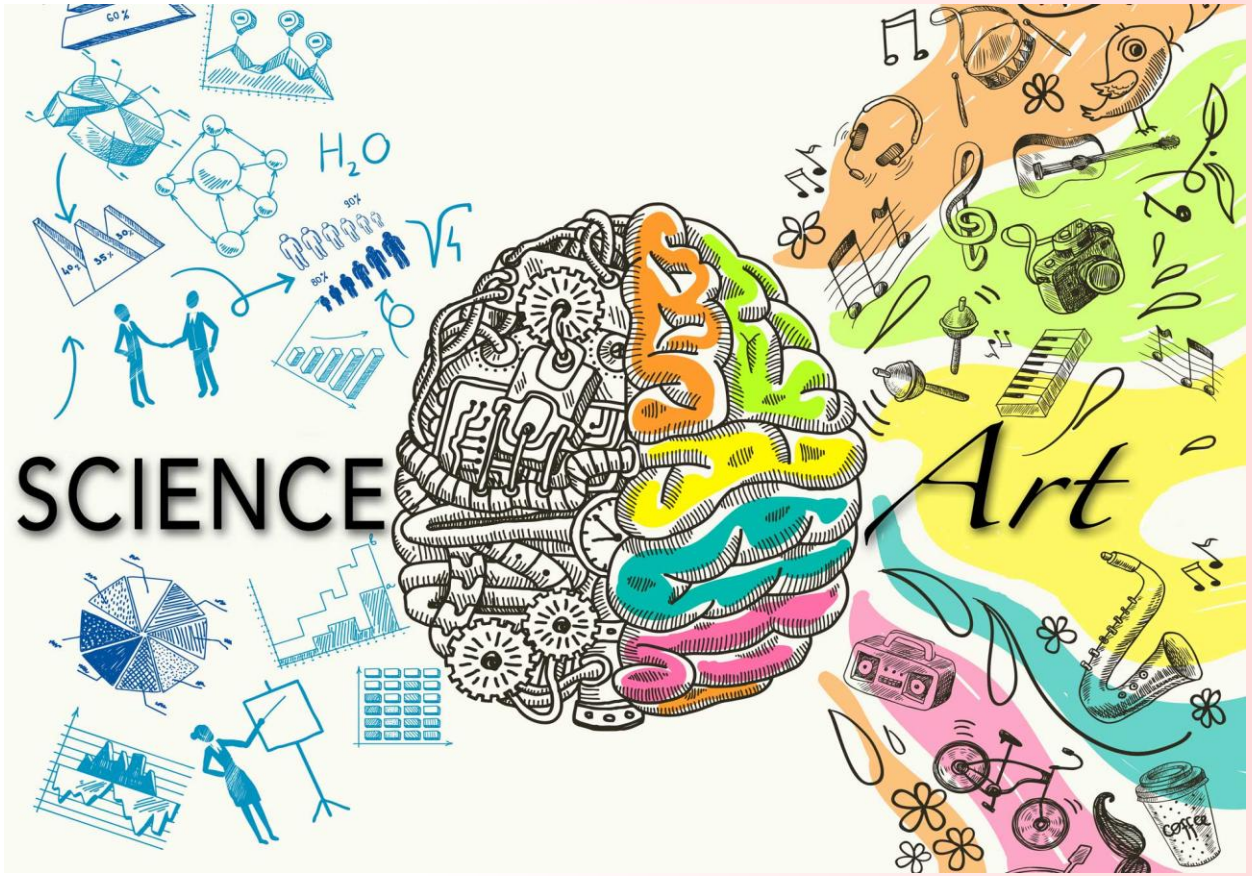
Science is art?

AI Overview

No

Science and art are not mutually exclusive and can be seen as complementary



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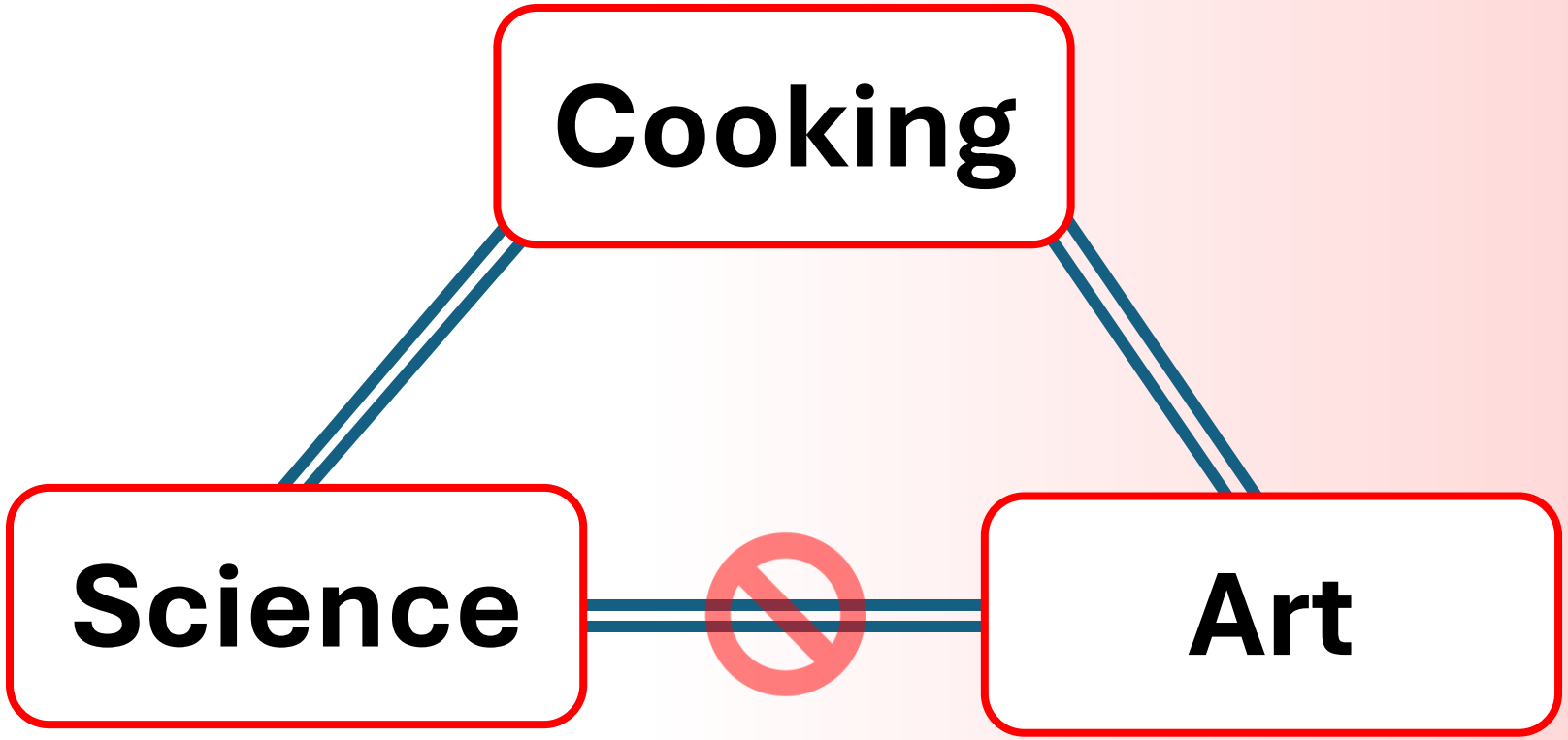
Science is art?

According to AI...



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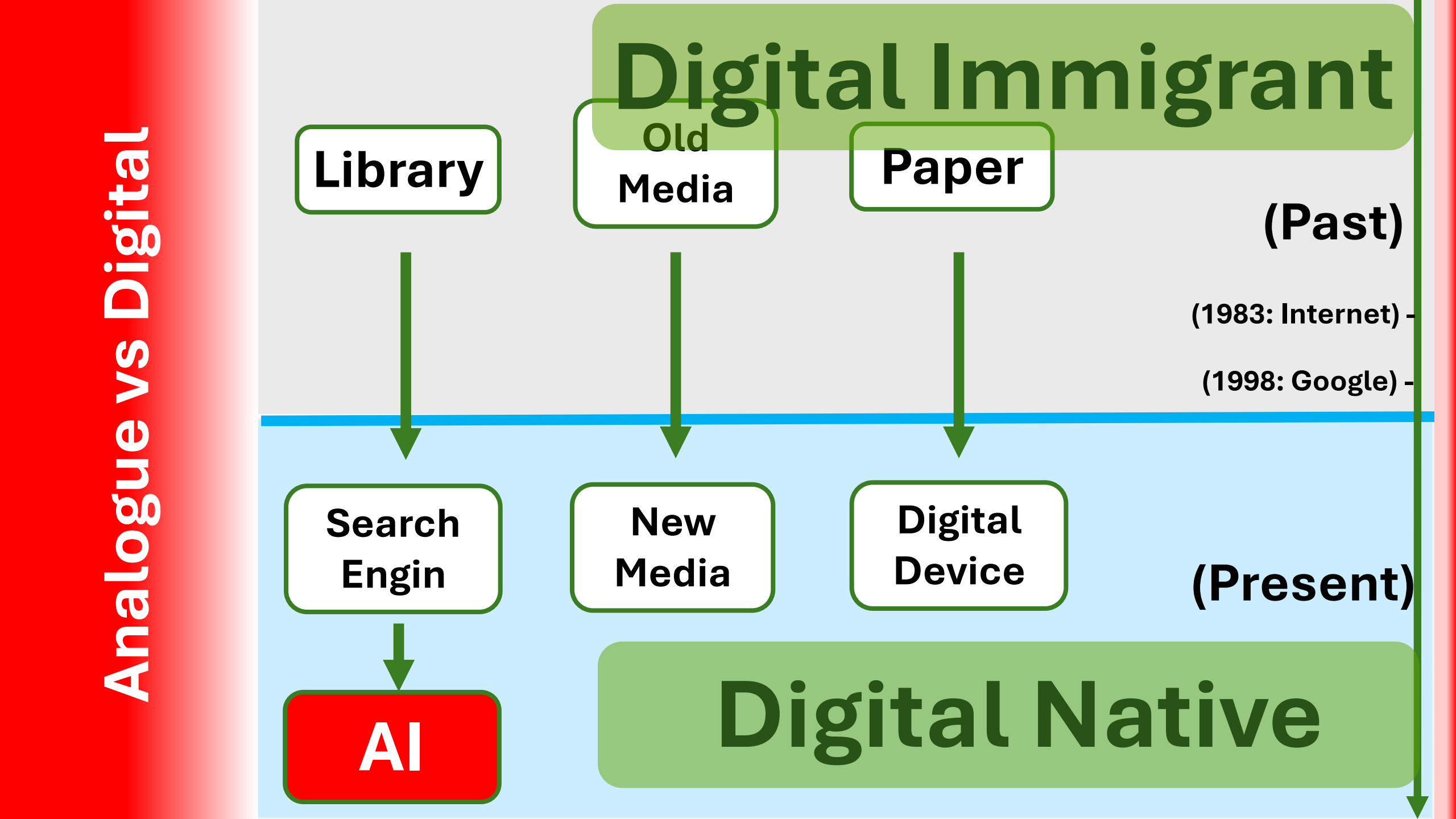
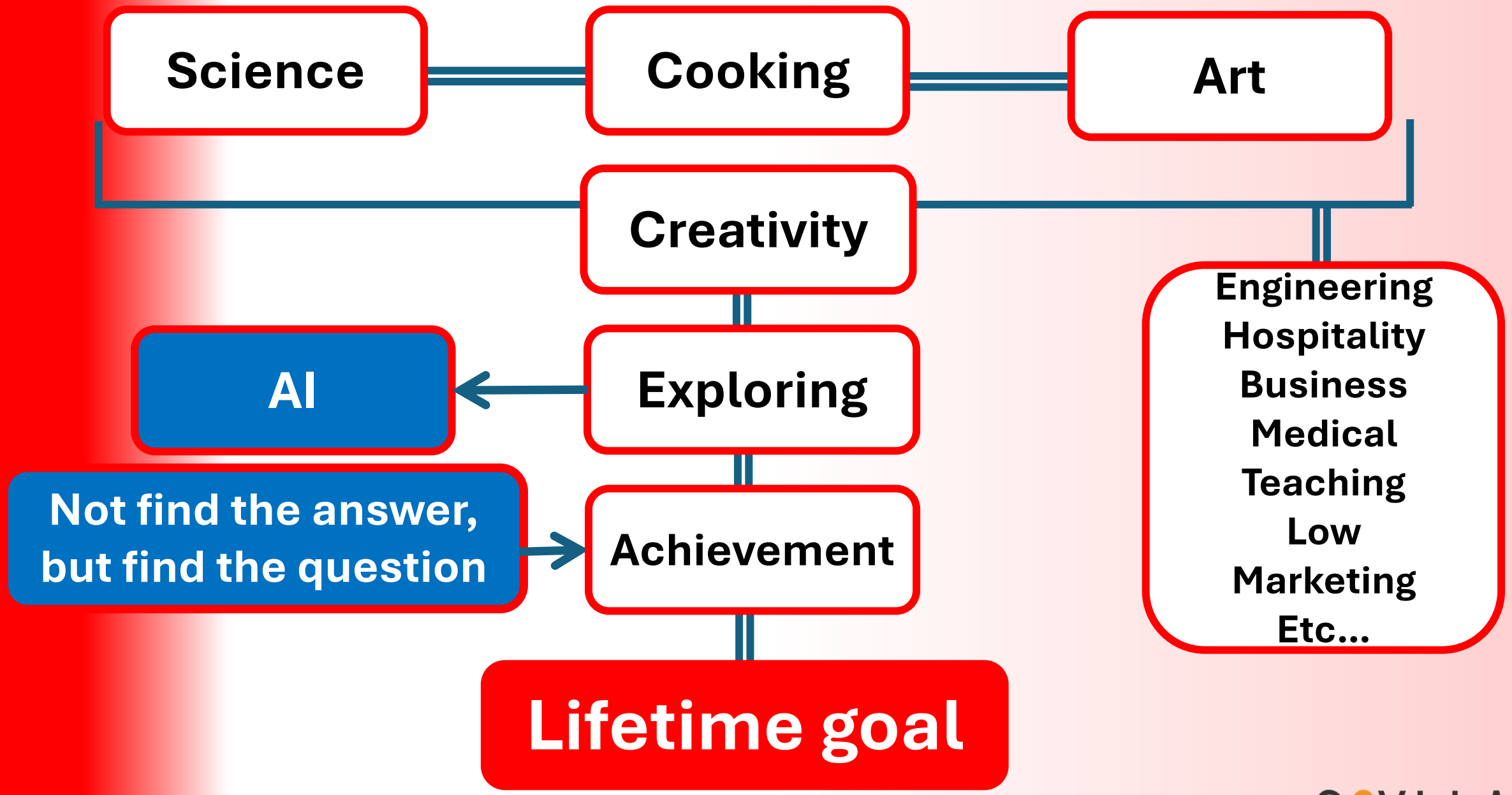

Analogue vs Digital
Digital Immigrant
Library
Old Media
Paper
(Past)
(1983: Internet) -
(1998: Google) -
Search Engin
New Media
Digital Device
(Present)
AI
Digital Native


Science
Cooking
Art
Creativity
Engineering
Hospitality
Business
Medical
Teaching
Low
Marketing
Etc...
AI
Exploring
Not find the answer,
but find the question
Achievement
Lifetime goal

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Key Words

Trial and Error

||

Science

||

Value

||

Life

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May The Force Be With You...

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