

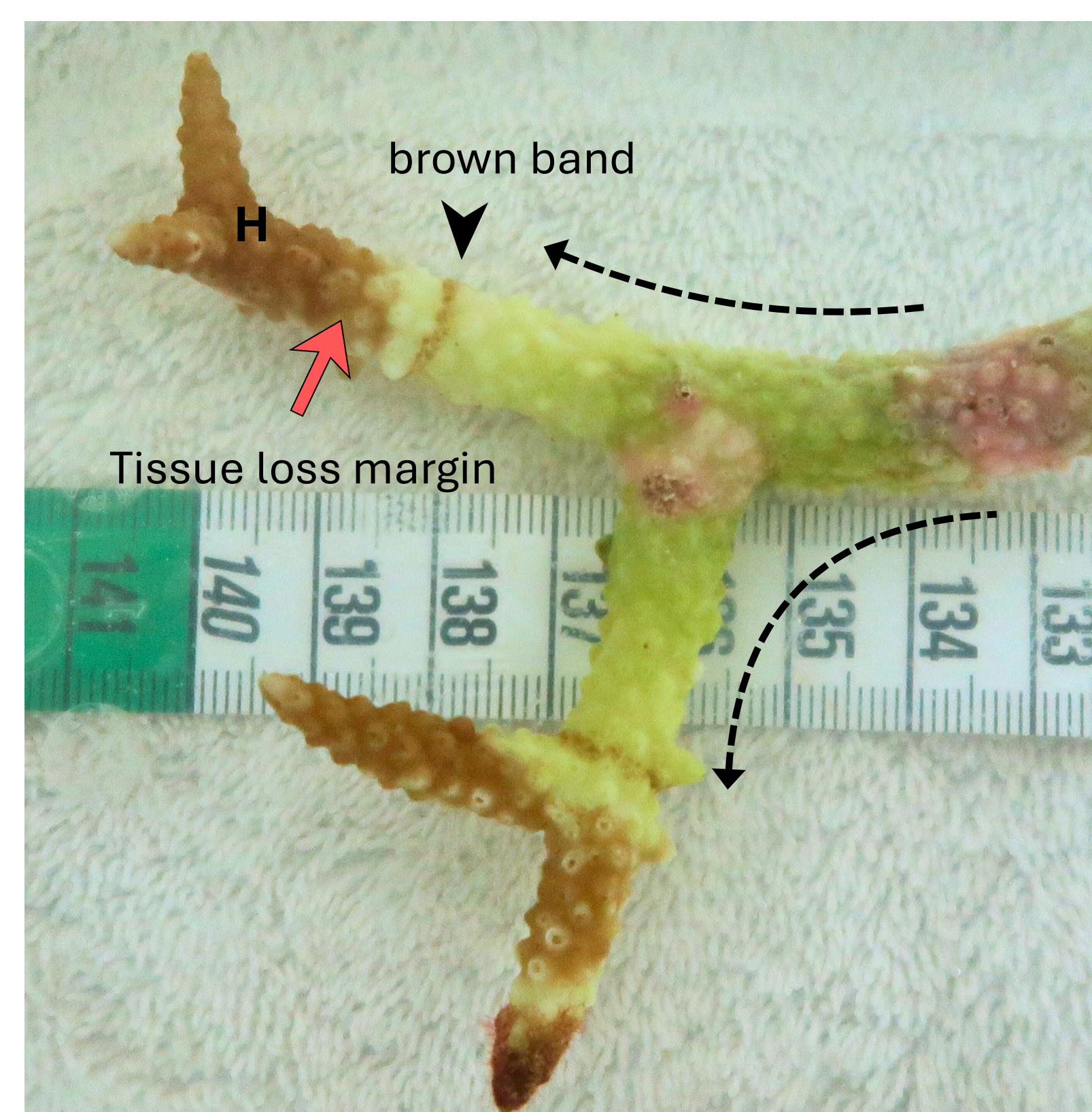
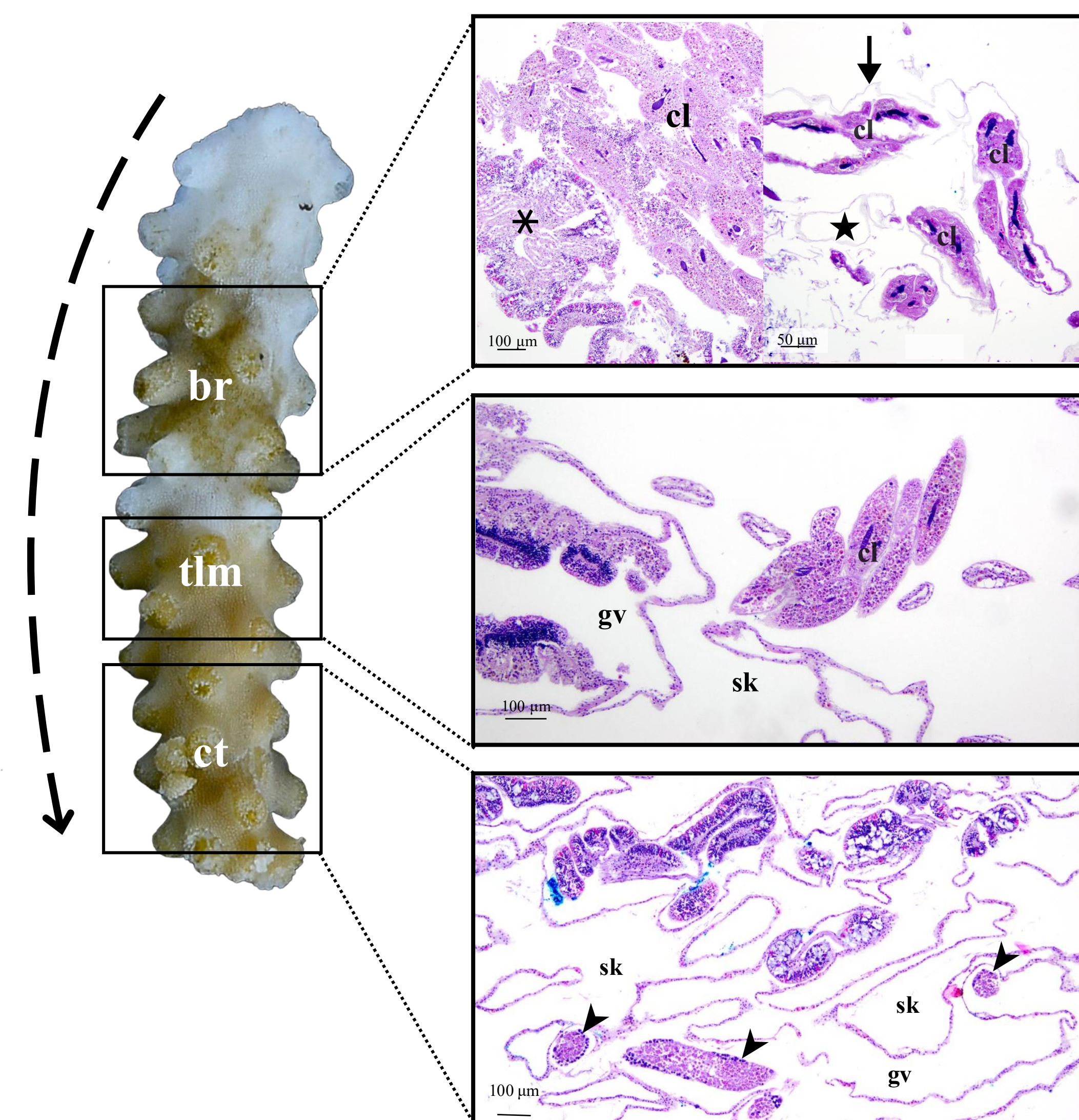
BACKGROUND & AIMS

Coral tissue loss and growth anomalies are increasingly reported across reef systems worldwide, yet their cellular dynamics and underlying causes remain poorly understood. We coupled gross and microscopic examination of lesions from tropical Indo-Pacific scleractinians and temperate Mediterranean gorgonians to compare ciliate-associated tissue-loss diseases and chronic growth anomalies, testing whether common histopathological signatures emerge across biogeographically distant systems and unrelated host taxa.

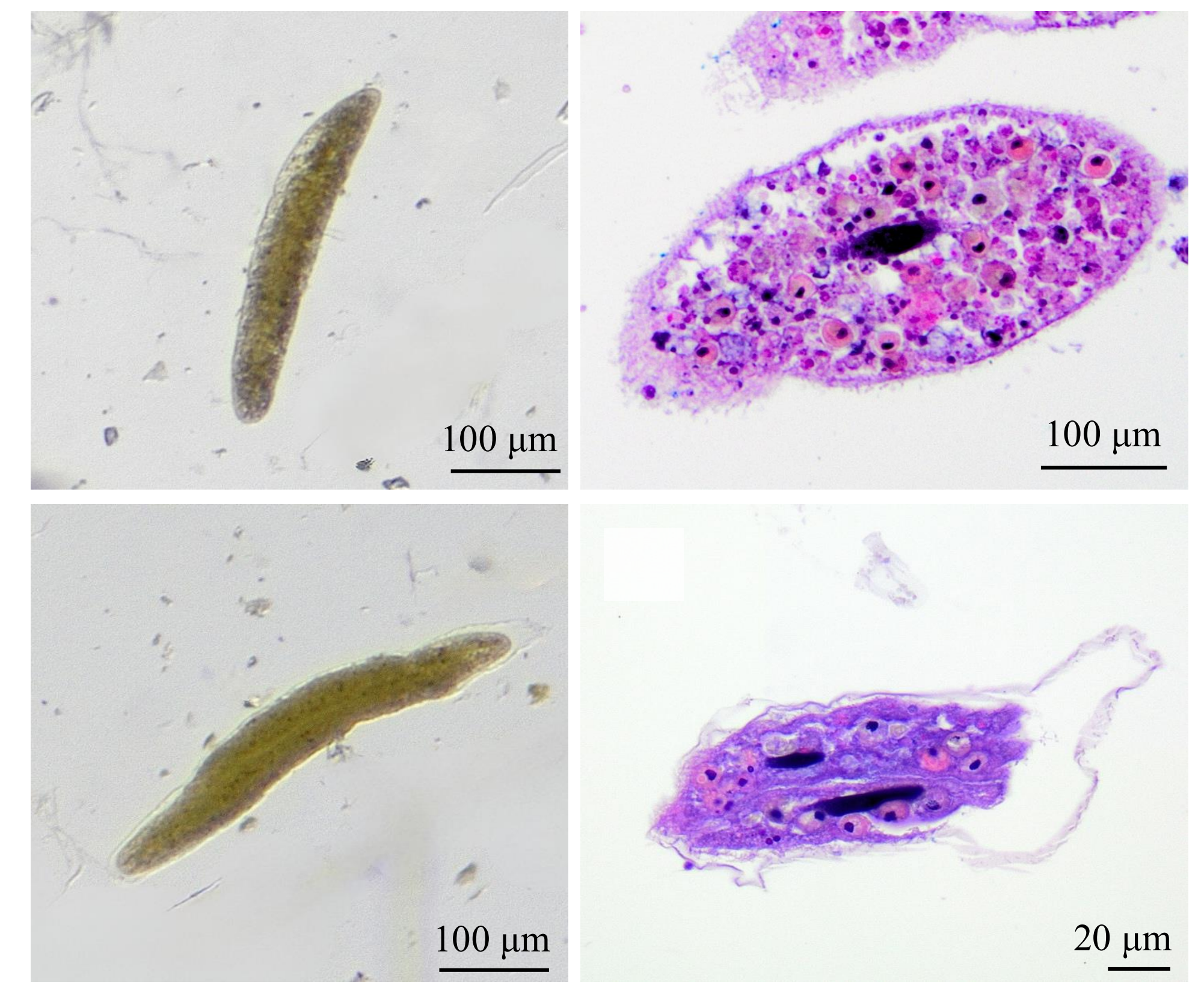
BROWN BAND DISEASE (BrB): A PRIMARY CILIATE PATHOGEN

First histopathological framework for BrB, Republic of Maldives · *Acropora cf. muricata* & *Philaster guamense* (Scuticociliatia)

Samples: 6 colonies, Faafu Atoll, Maldives - integrated gross, histological (H&E) and molecular (18S rRNA) diagnostics across three investigation areas



~ 1.2 mm/h lesion progression rate



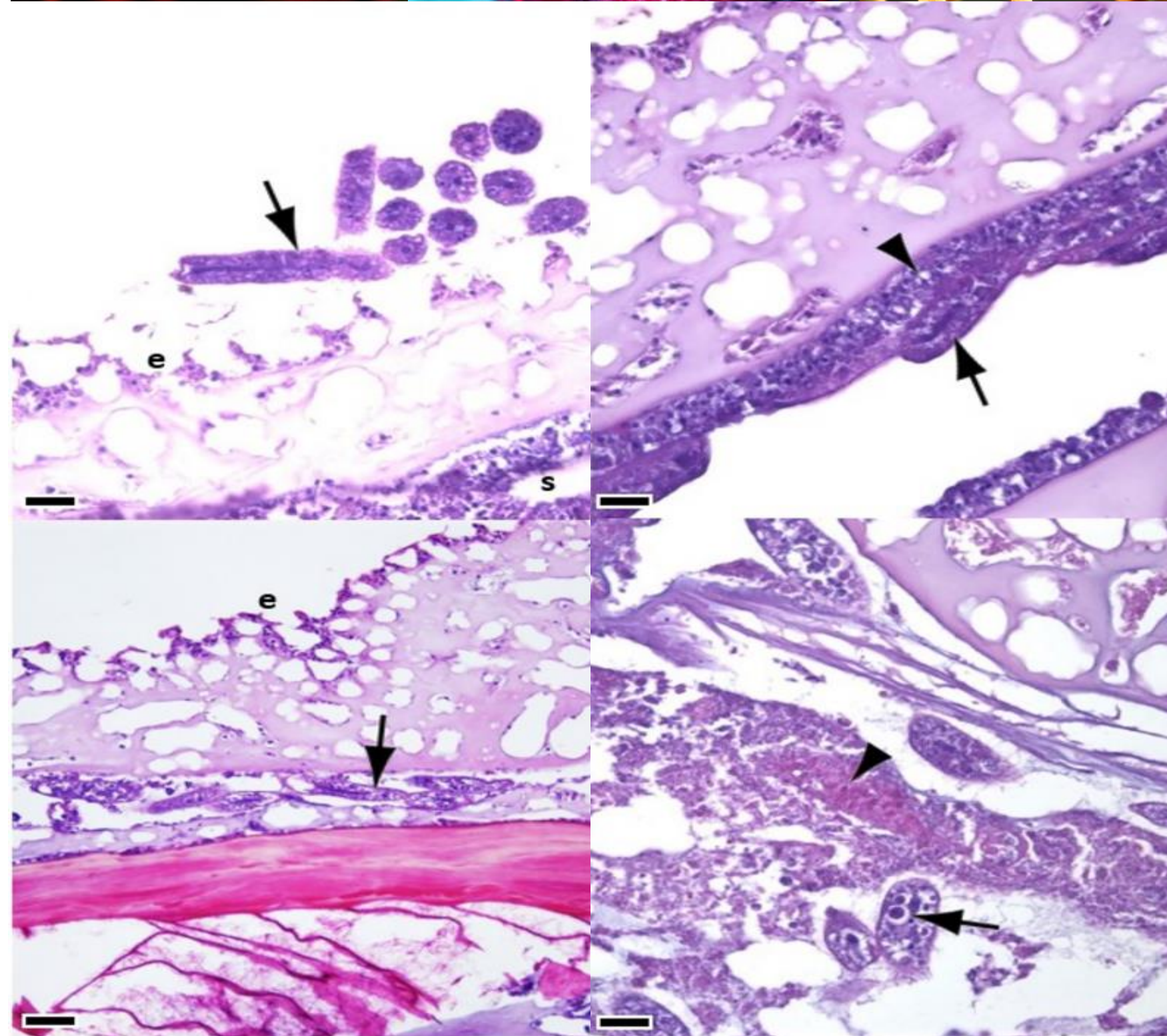
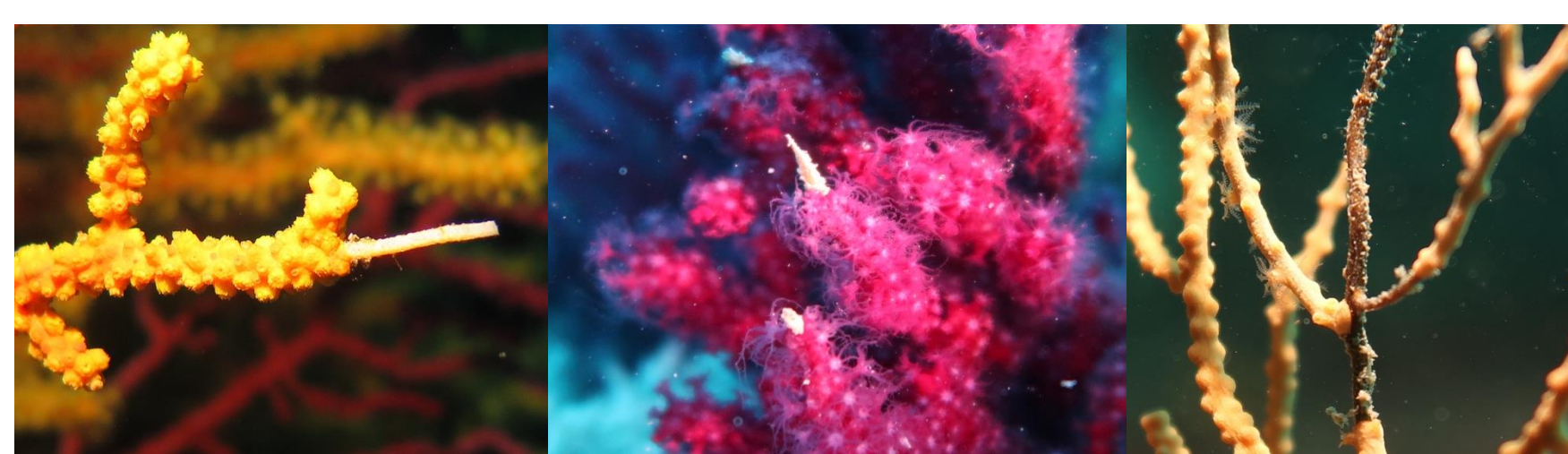
P. guamense confirmed by 18S rRNA + morphology

- Vegetative trophonts invade healthy tissue ahead of acute loss margin, with **no evidence of microbial co-infection**, then progressing **base-to-tip** toward **dormant encysted phase** at BrB area
- First histopathological description of BrB disease

CONVERGENT PATHOLOGY: CILIATES IN MEDITERRANEAN GORGONIANS

Eunicella cavolini, *Paramuricea clavata* & *Leptogorgia sarmentosa*

Histopathology of tissue loss lesions from Mediterranean Sea to investigate the possible role of ciliates in lesion development



Ciliates colonize intact epidermis and gastrodermis in Mediterranean gorgonians too, with species-specific signatures:

- granulocyte-driven inflammation in *P. clavata*
- epidermal necrosis only in *L. sarmentosa*

4/5
E. cavolini colonies with invasive ciliates

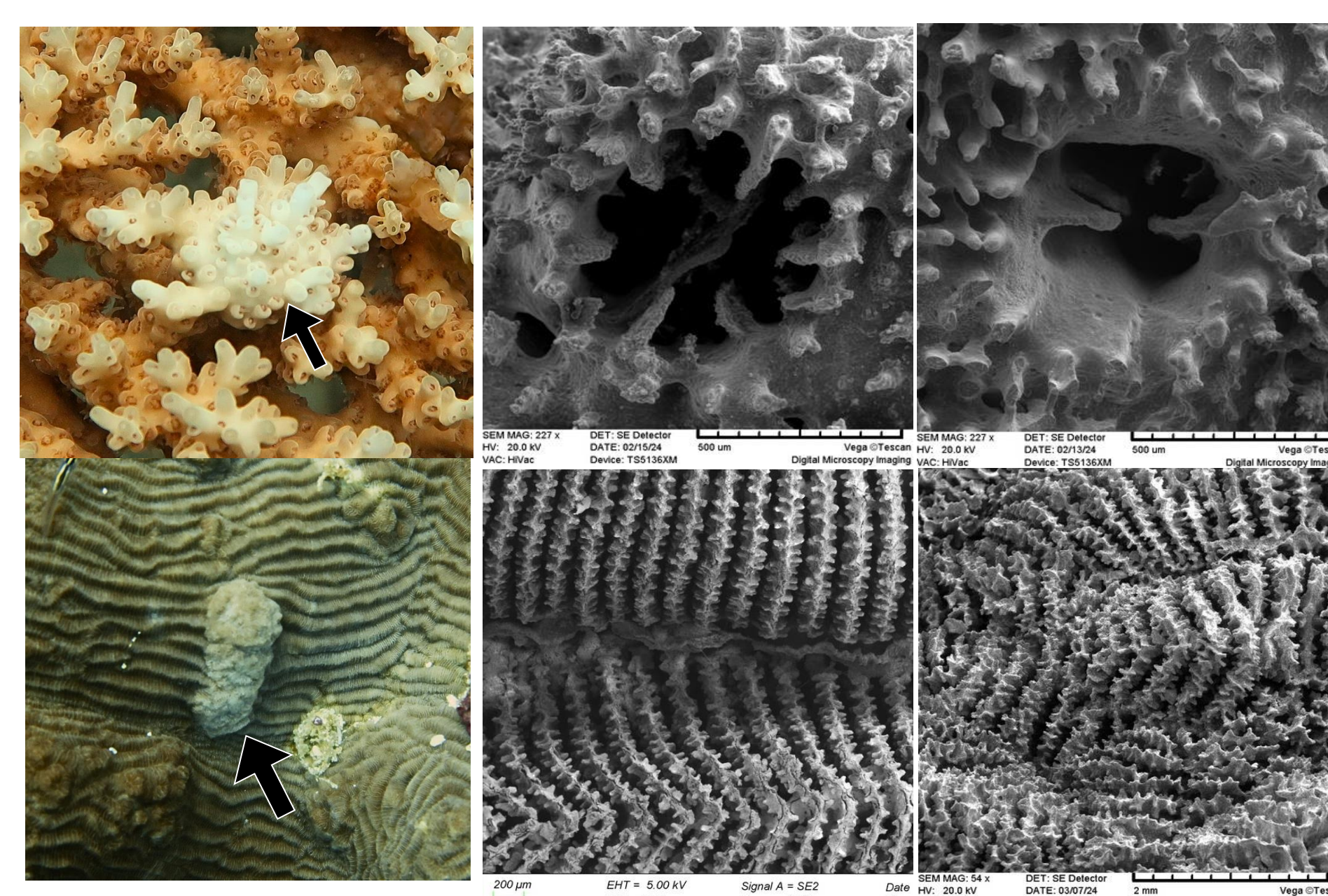
20/20
specimens with gastrodermal dissociation / necrosis

P. clavata
shows the greatest diversity of lesion types

GROWTH ANOMALIES: CHRONIC, MULTIFACTORIAL SKELETAL LESIONS

Acropora, *Montipora* & *Pachyseris*

15 growth anomalies were sampled around Faafu Atoll, Maldives for histology and scanning electron microscopy (SEM) to link microscopic lesions to ultrastructural changes



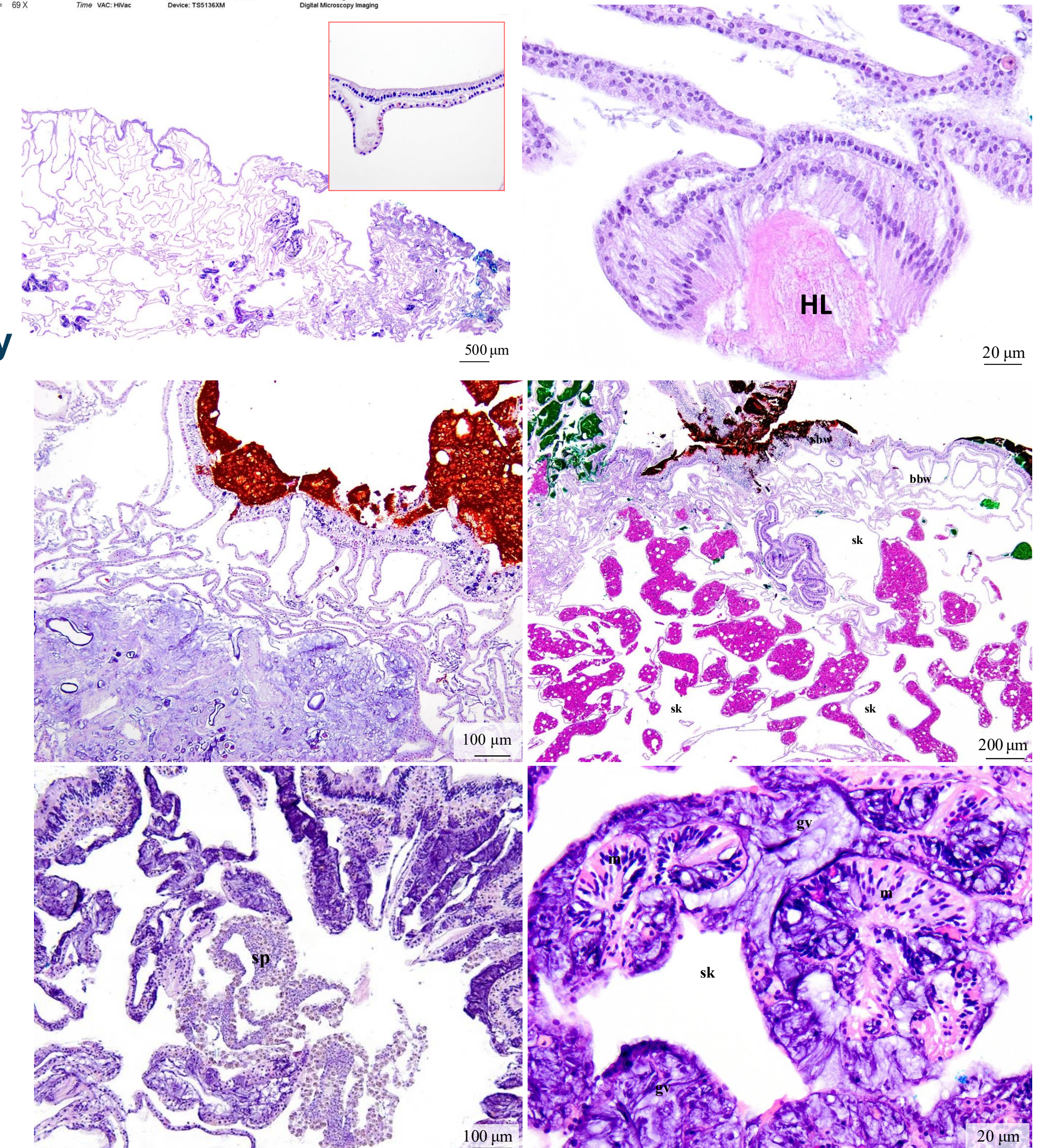
Histopathological GAs main traits:

- Basal body wall hyperplasia
- Calicoblast hypertrophy
- Centrally located focal mixed masses and solitary sponges
- endolithic role in lesion development
- Mucocyte hyperplasia in *Pachyseris*

15/15
GAs with basal body wall hyperplasia (100%)

80%
of GAs lacked gonadal development

$p < 0.001$
larger calice diameter in GA vs. healthy skeleton (SEM)



Multifactorial lesions with no single causative agent identified

CONCLUSIONS

Comparative histopathology across the Indo-Pacific and the Mediterranean reveals both convergent ciliate-driven pathologies and complex, multifactorial growth anomalies, establishing microscopic diagnostic as an essential tool for coral disease investigation and reef health management.

