

Phylum	Class/Label	Image Count	Instance Count
Arthropoda	Caridea	244	583
Chordata	Fish	1509	4510
	Fish-deep	107	116
	Batoidea	49	57
Cnidaria	Actiniaria	250	1395
	Gersemia	109	275
Echinodermata	Asteroidea	407	536
	Antedonidae	316	4449
	Ophiuroidea	121	1135
Porifera	Asconema-fol	120	185
	Asconema-meg	88	168
	Axinella/Phakellia	197	1084
	Caulophacus	50	77
	Lissodendoryx	430	4524
	Rossellidae	264	982

Table S1. Counts of instances and images per class in the DeepSee dataset.

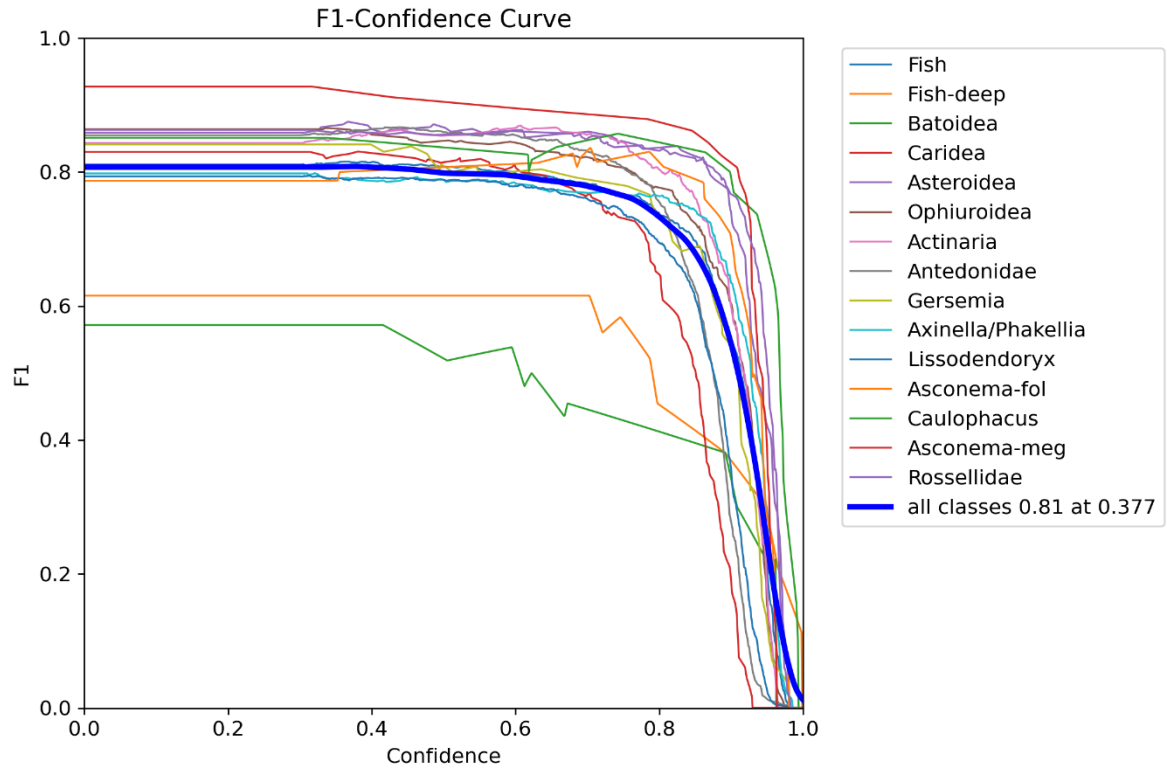


Figure S1. F1 curves for the DeepSee dataset.

Model	Parameters (Millions)	GFlops	Precision	Recall	mAP50	FPS
YOLOv5x	89.0	214.1	0.86	0.78	0.84	21.3
YOLOv8x	61.6	227.6	0.85	0.78	0.84	20.4
YOLOv10x*	31.6	170.0	0.86	0.77	0.84	21.5
YOLOv8s	9.8	23.4	0.82	0.73	0.81	29.2
YOLOv8m	23.2	67.5	0.85	0.76	0.83	27.0
YOLOv8l	39.4	145.3	0.87	0.76	0.84	25.6

Table S2. Performance of different YOLO models on the DeepSee validation dataset. The image size used for inference is 1280x1280 pixels. *YOLOv10x was released after the initial manuscript was written.

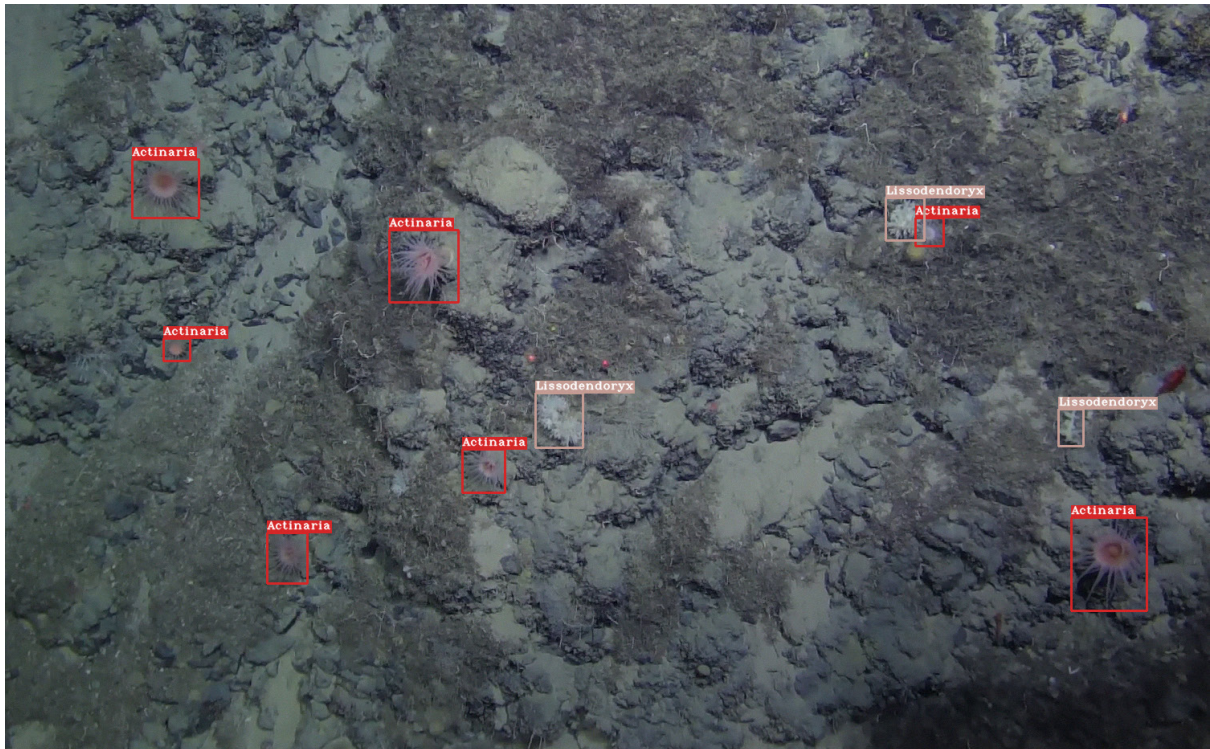


Figure S2. Example image from the Meyer dataset with DeepSee annotations. The image contains 3 clearly identifiable *Lissodendoryx* instances (annotated) whereas 7 counts of *Lissodendoryx* are logged in the Meyer paper.



Figure S3. The manual annotations in Figure 7 are updated to include the additional instances detected by the DeepSee model. Images are from the Meyer dataset.

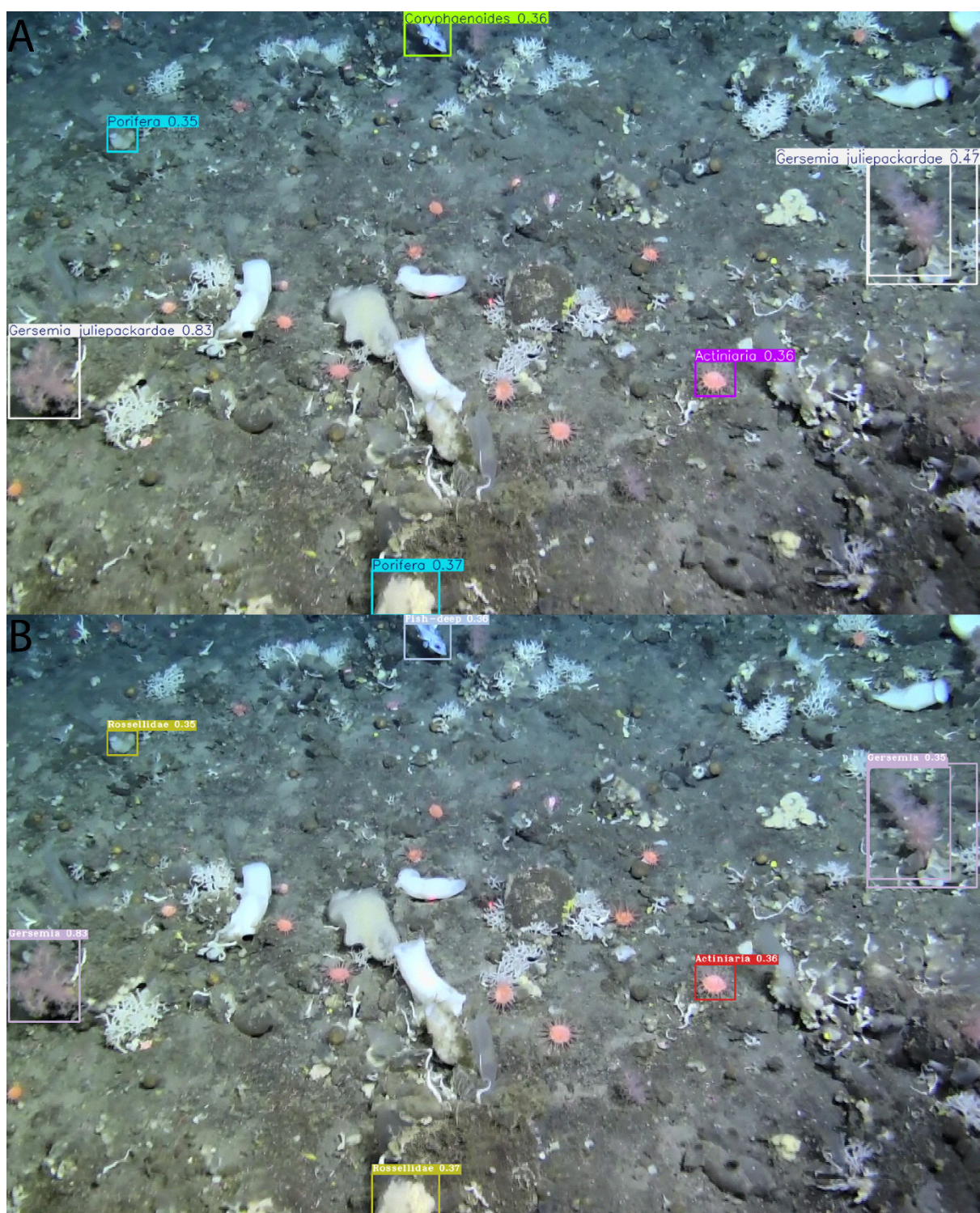


Figure S4. Detections on an image from the revised Meyer dataset using the MBARI/FathomNet model. MBARI classes (A) are relabeled to corresponding DeepSee classes (B).

MBARI Class	DeepSee Class
Gersemia juliepackardae	Gersemia
Porifera	Rossellidae
Coryphaenoides	Fish-deep
Zoantharia	Actiniaria
Hexactinellida	Rossellidae
Crinoidea	Antedonidae
Harriotta raleighana	Fish-deep
Acanthascinae	Rossellidae
Hymenaster	Asteroidea
Heteropolypus ritteri	Actinaria
Actinopterygii	Fish-deep
Pteraster	Asteroidea

Table S3. Remapping MBARI class labels to DeepSee labels for detections on the revised Meyer dataset.