Supplementary Materials

Automated coral detection and instance segmentation in underwater imagery: Evaluating YOLO model performance and transferability to mesophotic coral ecosystems

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Table S1. Box-detection and mask-segmentation metrics of the eight final models on the validation and test sets. All values are for the checkpoint selected on the validation set (best.pt). The validation set was used for early stopping and checkpoint selection; the test set was held out and is the basis of the results reported in the main text (subset sizes are given in Table S2). P, precision; R, recall; F1 is calculated from P and R. Test-set rows are shaded.

			Box detection					Mask segmentation				
Level	**Model**	**Split**	**P**	**R**	**mAP_{50}**	**$mAP_{50–95}$**	**F1**	**P**	**R**	**mAP_{50}**	**$mAP_{50–95}$**	**F1**
Species	YOLOv8x	Validation	0.852	0.760	0.850	0.795	0.803	0.850	0.762	0.851	0.778	0.804
		Test	0.775	0.719	0.781	0.724	0.746	0.767	0.718	0.779	0.703	0.742
	YOLOv9e	Validation	0.823	0.759	0.846	0.792	0.790	0.825	0.761	0.847	0.776	0.792
		Test	0.776	0.704	0.793	0.740	0.738	0.716	0.743	0.789	0.719	0.729
	YOLOv11x	Validation	0.830	0.752	0.852	0.797	0.789	0.832	0.753	0.854	0.783	0.791
		Test	0.825	0.696	0.789	0.735	0.755	0.819	0.693	0.787	0.713	0.751
	YOLOv12x	Validation	0.845	0.713	0.816	0.763	0.773	0.846	0.714	0.817	0.750	0.774
		Test	0.790	0.700	0.755	0.702	0.742	0.784	0.699	0.752	0.685	0.739
Genus	YOLOv8x	Validation	0.834	0.811	0.877	0.818	0.822	0.833	0.813	0.876	0.801	0.823
		Test	0.839	0.813	0.866	0.806	0.826	0.870	0.790	0.864	0.781	0.828
	YOLOv9e	Validation	0.828	0.807	0.881	0.821	0.817	0.824	0.805	0.879	0.802	0.814
		Test	0.801	0.816	0.870	0.804	0.808	0.803	0.812	0.870	0.776	0.807
	YOLOv11x	Validation	0.850	0.801	0.879	0.823	0.825	0.853	0.800	0.883	0.807	0.826
		Test	0.798	0.820	0.857	0.798	0.809	0.801	0.824	0.860	0.775	0.812
	YOLOv12x	Validation	0.843	0.779	0.844	0.785	0.810	0.845	0.778	0.845	0.766	0.810
		Test	0.821	0.782	0.840	0.778	0.801	0.823	0.784	0.842	0.754	0.803

Table S2. Numbers of images and annotated colony instances in the training, validation, and test subsets of the species-level and genus-level datasets. Both datasets contain the same 9,530 images and 22,398 annotated instances and differ only in their class labels; each was partitioned by its own random draw, so the two levels do not share the same subsets.

	Species-level dataset			Genus-level dataset		
Subset	**Images**	**% of images**	**Instances**	**Images**	**% of images**	**Instances**
Training	7,596	79.7	17,855	7,614	79.9	17,973
Validation	930	9.8	2,321	942	9.9	1,935
Test	1,004	10.5	2,222	974	10.2	2,490
Total	**9,530**	**100.0**	**22,398**	**9,530**	**100.0**	**22,398**

Table S3. Class-wise numbers of images and annotated colony instances in the training, validation, and test subsets of the species-level and genus-level datasets. Each image contains colonies of a single species.

	Training		Validation		Test		Total	
Class	**Images**	**Instances**	**Images**	**Instances**	**Images**	**Instances**	**Images**	**Instances**
Species-level dataset (57 classes)								
Acropora cervicornis	197	378	24	60	26	75	247	513
Acropora palmata	365	467	45	76	47	61	457	604
Acropora prolifera	116	188	14	21	16	39	146	248
Agaricia agaricites	208	550	26	53	26	55	260	658
Agaricia fragilis	79	94	9	11	11	13	99	118
Agaricia grahamae	36	57	4	5	5	7	45	69
Agaricia humilis	215	270	26	28	28	37	269	335
Agaricia lamarcki	480	627	60	88	61	75	601	790
Agaricia tenuifolia	213	379	26	37	28	42	267	458
Agaricia undata	24	24	3	3	4	4	31	31
Cladocora arbuscula	171	262	21	45	22	28	214	335
Colpophyllia natans	277	351	34	58	36	53	347	462
Dendrogyra cylindrus	246	318	30	43	32	44	308	405
Dichocoenia stokesi	24	26	3	3	3	3	30	32
Diploria labyrinthiformis	338	446	42	53	43	65	423	564
Eusmilia fastigiata	304	2,490	38	440	39	179	381	3,109
Favia fragum	171	209	21	34	22	24	214	267
Isophyllia rigida	76	79	9	9	11	11	96	99
Isophyllia sinuosa	144	187	18	21	19	23	181	231
Leptoseris cailleti	17	22	2	4	3	3	22	29
Leptoseris cucullata	44	48	5	6	7	7	56	61
Madracis carmabi	17	48	2	2	3	9	22	59
Madracis decactis	167	1,475	20	247	22	181	209	1,903
Madracis formosa	49	85	6	17	7	11	62	113
Madracis mirabilis	15	15	1	1	3	6	19	22
Madracis pharensis	98	266	12	49	13	48	123	363

	Training		Validation		Test		Total	
Class	**Images**	**Instances**	**Images**	**Instances**	**Images**	**Instances**	**Images**	**Instances**
Madracis senaria	9	12	1	1	2	2	12	15
Manicina areolata	284	423	35	42	37	47	356	512
Meandrina danae	3	8	1	1	1	1	5	10
Meandrina jacksoni	2	8	2	3	2	3	6	14
Meandrina meandrites	324	364	40	41	42	46	406	451
Montastraea cavernosa	376	499	47	65	48	66	471	630
Mussa angulosa	161	326	20	33	21	36	202	395
Mycetophyllia aliciae	55	55	6	6	8	8	69	69
Mycetophyllia danaana	31	31	3	3	5	5	39	39
Mycetophyllia ferox	26	28	3	3	4	4	33	35
Mycetophyllia lamarckiana	57	57	7	7	8	8	72	72
Mycetophyllia reesi	13	16	1	1	3	5	17	22
Oculina diffusa	43	75	5	8	6	12	54	95
Oculina varicosa	92	371	11	104	12	81	115	556
Orbicella annularis	258	3,504	32	264	33	440	323	4,208
Orbicella faveolata	353	587	44	78	45	66	442	731
Orbicella franksi	70	153	8	12	10	18	88	183
Porites astreoides	260	383	32	37	33	63	325	483
Porites branneri	29	29	3	4	5	5	37	38
Porites colonensis	10	15	1	1	2	6	13	22
Porites divaricata	32	107	4	5	4	4	40	116
Porites furcata	33	87	4	10	5	22	42	119
Pseudodiploria clivosa	16	17	2	2	2	3	20	22
Pseudodiploria strigosa	21	21	2	2	4	4	27	27
Scolymia cubensis	230	241	28	29	30	31	288	301
Siderastrea radians	267	383	33	57	34	42	334	482
Siderastrea siderea	309	463	38	62	40	65	387	590
Siderastrea stellata	22	34	2	2	4	6	28	42
Solenastrea bournoni	60	104	7	13	8	11	75	128

	Training		Validation		Test		Total	
Class	**Images**	**Instances**	**Images**	**Instances**	**Images**	**Instances**	**Images**	**Instances**
Solenastrea hyades	49	82	6	10	7	7	62	99
Stephanocoenia michelini	10	11	1	1	2	2	13	14
Total	**7,596**	**17,855**	**930**	**2,321**	**1,004**	**2,222**	**9,530**	**22,398**
Genus-level dataset (24 classes)								
Acropora	680	1,076	85	140	85	149	850	1,365
Agaricia	1,257	1,948	157	235	158	276	1,572	2,459
Cladocora	171	264	21	27	22	44	214	335
Colpophyllia	277	366	34	46	36	50	347	462
Dendrogyra	246	317	30	38	32	50	308	405
Dichocoenia	24	26	3	3	3	3	30	32
Diploria	376	485	47	65	47	63	470	613
Eusmilia	304	2,544	38	228	39	337	381	3,109
Favia	171	215	21	25	22	27	214	267
Isophyllia	221	253	27	32	29	45	277	330
Leptoseris	62	70	7	8	9	12	78	90
Madracis	357	1,923	44	121	46	431	447	2,475
Manicina	284	414	35	48	37	50	356	512
Meandrina	333	382	41	46	43	47	417	475
Montastraea	376	508	47	66	48	56	471	630
Mussa	161	326	20	38	21	31	202	395
Mycetophyllia	184	190	23	24	23	23	230	237
Oculina	135	505	16	65	18	81	169	651
Orbicella	682	4,196	85	435	86	491	853	5,122
Porites	365	627	45	85	47	66	457	778
Scolymia	230	241	28	30	30	30	288	301
Siderastrea	599	898	74	109	76	107	749	1,114
Solenastrea	109	188	13	20	15	19	137	227
Stephanocoenia	10	11	1	1	2	2	13	14
Total	**7,614**	**17,973**	**942**	**1,935**	**974**	**2,490**	**9,530**	**22,398**