The Fishnet Open Images Database:
A Dataset for Fish Detection and Fine-Grained Categorization in Fisheries

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AI.FISH

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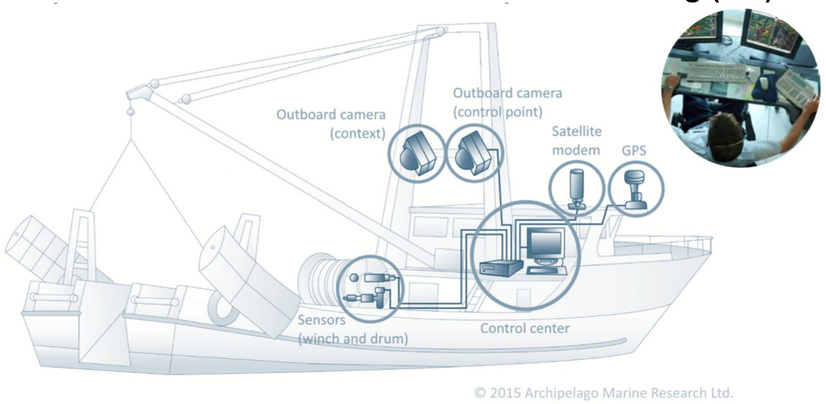
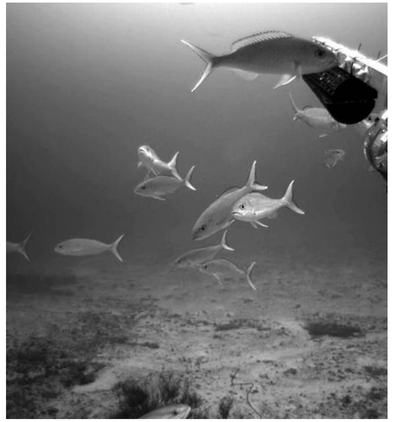
Motivation: Fisheries Electronic Monitoring (EM)



- Video cameras onboard commercial fishing vessels collect data for fisheries management and regulation.
- Large quantities of video are reviewed manually to identify fish.
- Computer vision can help, but there is a **lack of public data**.

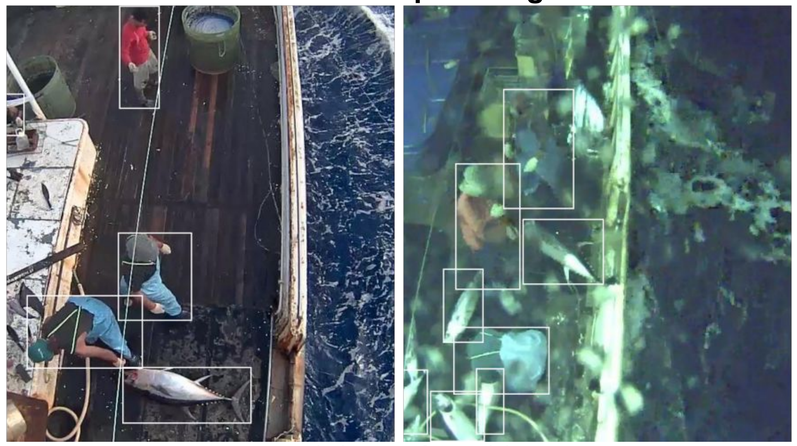
Other Fisheries Data (Underwater):



Source: NOAA

EM Data (Above water, onboard):

Solution: The Fishnet Open Images Database

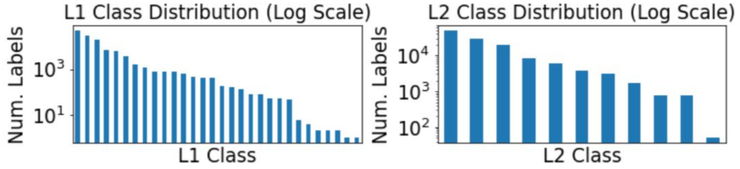


Example images from Fishnet.
Left: Clear conditions. Right: Challenging conditions.

Super-Class (L2)	Fine-Grained Species (L1)	# Train	# Val	# Test
HUMAN	Human	205,506	38,725	36,809
ALB	Albacore	37,255	7,843	4,626
YFT	Yellowfin tuna	18,097	3,693	6,995
SKJ	Skipjack tuna	18,013	1,373	142
OTH	Wahoo, Sickle pomfret, Great barracuda, Unknown, Long snouted lancetfish, Snake mackerel, Rainbow runner, Pomfret, Mola mola, Escolar, Lancetfish, Brama	7,621	404	312
BET	Bigeye tuna	3,353	1,639	1,079
BILL	Indo Pacific sailfish, Striped marlin, Swordfish, Black marlin, Shortbill spearfish, Blue marlin, Marlin	1,831	444	844
DOL	Mahi mahi	1,735	766	1,185
LAG	Opah	1,338	172	171
OIL	Oilfish, Roudie scolar	502	135	145
SHARK	Shark, Thresher shark	390	283	112
PLS	Pelagic stingray	25	8	18

Dataset Characteristics:

- 73 EM cameras, 86,000 images, 400,000 bounding boxes
- 29 fine-grained fish species, 11 super-classes
- Challenges: real-world data imbalance, harsh weather conditions, poor lighting, occlusion



Baseline Results:

Object Detection (RetinaNet w/ ResNet101+FPN)

Test on different class groupings and in class-agnostic ("CA") setting.
Compare to RetinaNet performance on COCO (40.4 AP / 44.1 CA-AP)

Label Set	Classes	AP	CA-AP	AP-Seen	AP-Unseen
L1	21	21.3	46.7	**25.4**	17.1
L2	10	29.0	46.1	**33.8**	22.5
Tuna/Not-Tuna	2	41.2	48.2	41.7	**44.5**
Fish	1	48.8	48.8	46.6	**53.0**

"Seen" / "Unseen": Cameras included / not included in training set
Tuna: Albacore, Yellowfin, Skipjack, Bigeye; Non-Tuna: All others

Species Classification (Inception V3)

Compare to Inception V3 performance on ImageNet (94.4), iNat2017 (64.2)

Label Set	Classes	Top-1	Top-1 Tuna	Top-1 Non-Tuna	Top-1 Seen	Top-1 Unseen
L1	21	73.2	79.9	41.5	80.3	62.4
L2	10	75.7	80.9	48.7	84.0	63.3

Dataset available at: http://fishnet.ai