SUPPLEMENTARY INFORMATION

Assessment of sustainable baits for passive fishing gears through automatic fish behavior recognition

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Bait	Polymers	Producers	Brand	Grade	Diffusion time	Melt Flow Index (g/10 min)	Melting Temperature
C17	Polyvinyl alcohol (PVOH)	Kuraray	MowiFlex™	C600	Slow diffusion (50% diffusion over 24 days)	14-20	170°C
C600	Polyvinyl alcohol (PVOH)	Kuraray	MowiFlex™	C17	Slightly faster diffusion (60% mean diffusion over 24 days)	15-35	165°C
Lactips	Polyvinyl alcohol (PVOH) obtained from 60% milk casein proteins	Lactips	CareTips®	CareTips 300D	Faster diffusion than C17 and C600	Undetermined	110°C

Supplementary Table S1: Technical specifications of the bio-bait.



Supplementary Figure S2: a) Brabender® internal mixture machine, and b) Example of the bio-bait sample in its final form.



Supplementary Figure S3: Groundtruth/manual annotations (a) and tracks (b) for the different annotation labels used for model training and testing.

	Fish track database		
	Preprocess	Approach for case study	Values obtained in case study
	Add Behavioral Metrics	Behavior catalogues combined with available movement ecology packages	3205 fish with 104 behavioral metrics
	Filter	Fish detections per track < 10	204 filtered fish with 104 behavioral metrics
-	Selection of Metrics		
	Correlation Test	Pearson's r	Reduced to 72 behavioral metrics
	Random Forest Feature Importance	 Recursive elimination (Leave-One-Out) 	Final behavioral metrics: 12 metrics
	Training	Step-wise approach	
*******	Hyperparameters fine-tuning	Random Forest optimization Step 1: Find optimal range of hyperparameters Step 2: Test combinations of optimal hyperparameters	<pre>mtty = 1, ntree = 100, max nodes = 50, node size = 2, sample size = 50, split criterion = Gini, k-fold = 10, iterations = 30</pre>
	Training with final hyperparameters	Random Forest with optimized hyperparameters	Train set: 204 manually-validated behaviors
	Evaluation		
********	Test on manually-validated behaviors	Predict behavior class with probability scores with trained Random Forest	Test set: 97 manually-validated behaviors
••••••••	Apply evaluation metrics	 Accuracy, Precision, Recall, F1, Sensitivity 	 Evaluation score: Accuracy = 91.75%, F1 score = 90%, Precision = 90%, Recall = 90%
	Application		
	Apply classifier on predicted fish tracks	Add final behavioral metrics and predict with trained model	New set: 178,508 predicted fish tracks
	Filter	Species probability > 89%, Behavior probability > 52%	Final set: 1,590 filtered fish tracks
	Manualiy validate behaviors	Final evaluation and storage of fish tracks and detection points for analysis	• 63 groundtruth benaviors Accuracy = 88.91%, F1 score = 94.13%,
	Behavior Analysis		Precision = 90.72%, Recall = 97.80%

Supplementary Figure S4: Diagram of the stepwise process towards an automatic behavior classification.

Supplementary Table S5	: Exhaustive	list of be	havior	metrics	considered.
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Μ	Morphological Metrics							
	Behavioral Metrics	Mathematical Representation	Description					
1	Fish size (mean)	$mean_{A} = \frac{1}{n} \sum_{i=1}^{n} A_{i}$ Where: • $mean_{A}$ is the mean average of fish size • $\sum_{i=1}^{n} A_{i}$ is the sum of all individual fish sizes from A_{1} to A_{i}	Area of the fish annotation for each of its successive move. Larger annotations can indicate the fish is closer to the camera. A rapid increase could					
2	Fish size (median)	$median(A) = A_{\left(\frac{n+1}{2}\right)}$ $median(A) = \frac{A_{\left(\frac{n}{2}\right)} + A_{\left(\frac{n}{2}+1\right)}}{2}$	suggest movement toward the bait, while a rapid decrease could indicate retreat.					
3	Fish size variability (standard deviation)	$\sigma(A_{annotation})$						
4	Fish size variability (interquartile range)	$IQR(A_{annotation})$						
5	Fish size change rate (mean)	$mean\left(\frac{\Delta A}{\Delta time}\right)$						
6	Fish size change rate (median)	median $\left(\frac{\Delta A}{\Delta time}\right)$						
7	Minimum fish size	$min(A_{annotation})$						
8	Maximum fish size	$max(A_{annotation})$						
9	Fish size (25 th percentile) Fish size (75 th percentile)	$Q_1(A) = F^{-1}(0.25)$ Where: • $Q_1(A)$ is the 25 th percentile of fish size (A) • F^{-1} is the inverse of the cumulative distribution function (CDF) of A $Q_3(A) = F^{-1}(0.75)$						
		 Where: Q₃(A) is the 75th percentile of fish size (A) F⁻¹ is the inverse of the cumulative distribution function (CDF) of A 						
Po	sitional Metrics							
	Behavioral Metrics	Mathematical Formula	Description					
11 12	Relative size-to-distance ratio (mean) Relative size-to-distance ratio (median)	mean($\frac{distance_{move}}{time}$)	Fish size over the distance of the fish's successive moves relative to the bait. An approximation considering the 2D limitation into the fish's three- dimensional movement relative to the bait.					
13	Distance to bait (mean)	$mean(d_{fish \rightarrow stimuli})$	Distance of the center					
14	Distance to bait (median)	$median(d_{fish \rightarrow stimuli})$	to the center point of					
15	Minimum distance to bait	$min(d_{fish \rightarrow stimuli})$	the bait (x, y). Short distances can indicate					
16	Maximum distance to bait	$max(d_{fish \rightarrow stimuli})$	interest.					
17	Distance to bait (25 th percentile)	$Q_1(d_{fish\to stimuli}) = F^{-1}(0.25)$						

	Distance to bait (75 th	$Q_3(d_{fish \to stimuli}) = F^{-1}(0.75)$	
	percentile)		4
19	Distance to bait	$sd(d_{fish ightarrow stimuli})$	
	variability (standard		
20	deviation)		_
20	Distance to ball	$IQR(a_{fish \rightarrow stimuli})$	
	range)		
21	Distance to bait	skewness(d city string it)	_
21	skewness	Shew hess (afish-stimuli)	
22	Kmeans-based proximity zones	$kmeans(d_{fish \rightarrow stimuli}), centers = 3$	Spatial distribution of a fish (Close, Mid,
23	Frequency in most	fmode	Far) relative to the bait
	visited zone	, moue	based on k-means
			clustering
24	Entropy of fish	$p = \frac{frequency}{drequency}$	Measure of the
	swimming movement	total count	randomness of
		$E = -\sum (P \times log_2 P)$	movement across the
			different proximity
25	Frequency of entering	f	Erequency of how fish
23	the close proximity zone	Jentering	go back and forth from
	and crosse proximity zone		the bait that could
			indicate hesitation
26	Total frequency in close	f _{close}	Time spent close to the
	proximity zone	20050	bait
27	Total frequency of fish	$f_{closespread}$	Time spent close to the
	key points (head and tail)	·	bait including the key
	in close proximity zone		points of fish's head
20	Noushan af faile and former	N	and tail
28	(mean)	$mean(\frac{N_{fishes}}{N_{c}})$	fish in a frame
29	Number of fish per frame	Nfishac	-
27	i vanicer of fish per frame	$median(\frac{-1}{2})$	
	(median)	`N _{frame} ´	
30	(median) Number of fish per frame	N _{frame} N _{fishes}	-
30	(median) Number of fish per frame (standard deviation)	$\frac{N_{frame}}{sd(\frac{N_{fishes}}{N_{frame}})}$	_
30 31	(median) Number of fish per frame (standard deviation) Number of fish per frame	$\frac{N_{frame}}{sd(\frac{N_{fishes}}{N_{frame}})}$	-
30 31	(median) Number of fish per frame (standard deviation) Number of fish per frame (interquartile range)	$\frac{N_{frame}}{sd(\frac{N_{fishes}}{N_{frame}})}$ $IQR(\frac{N_{fishes}}{N_{frame}})$	-
30 31 32	(median) Number of fish per frame (standard deviation) Number of fish per frame (interquartile range) Number of fish per frame	$\frac{N_{frame}}{Sd(\frac{N_{fishes}}{N_{frame}})}$ $IQR(\frac{N_{fishes}}{N_{frame}})$ (N_{fishes})	-
30 31 32	(median) Number of fish per frame (standard deviation) Number of fish per frame (interquartile range) Number of fish per frame (25th percentile)	$\frac{N_{frame}}{sd(\frac{N_{fishes}}{N_{frame}})}$ $IQR(\frac{N_{fishes}}{N_{frame}})$ $Q_1\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.25)$	
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30 31 32 33	(median) Number of fish per frame (standard deviation) Number of fish per frame (interquartile range) Number of fish per frame (25th percentile) Number of fish per frame (75th percentile)	$\frac{N_{frame}}{Sd(\frac{N_{fishes}}{N_{frame}})}$ $IQR(\frac{N_{fishes}}{N_{frame}})$ $Q_1\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.25)$ $Q_3\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.75)$	
$\begin{array}{c} 30\\ \hline 31\\ \hline 32\\ \hline 33\\ \hline 34 \end{array}$	(median) Number of fish per frame (standard deviation) Number of fish per frame (interquartile range) Number of fish per frame (25th percentile) Number of fish per frame (75th percentile)	$\frac{N_{frame}}{Sd(\frac{N_{fishes}}{N_{frame}})}$ $IQR(\frac{N_{fishes}}{N_{frame}})$ $Q_1\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.25)$ $Q_3\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.75)$	
30 31 32 33 34	(median) Number of fish per frame (standard deviation) Number of fish per frame (interquartile range) Number of fish per frame (25th percentile) Number of fish per frame (75th percentile) Minimum number of fish per frame	$\frac{(N_{frame})}{Sd(\frac{N_{fishes}}{N_{frame}})}$ $IQR(\frac{N_{fishes}}{N_{frame}})$ $Q_1\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.25)$ $Q_3\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.75)$ $min(\frac{N_{fishes}}{N_{frame}})$	
30 31 32 33 34 35	(median) Number of fish per frame (standard deviation) Number of fish per frame (interquartile range) Number of fish per frame (25th percentile) Number of fish per frame (75th percentile) Minimum number of fish per frame Maximum number of	$\frac{(N_{frame})}{Sd(\frac{N_{fishes}}{N_{frame}})}$ $\frac{IQR(\frac{N_{fishes}}{N_{frame}})}{Q_1\left(\frac{N_{fishes}}{N_{frame}}\right)} = F^{-1}(0.25)$ $Q_3\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.75)$ $\frac{min(\frac{N_{fishes}}{N_{frame}})}{N_{frame}}$	
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30 31 32 33 34 35 36	(median) Number of fish per frame (standard deviation) Number of fish per frame (interquartile range) Number of fish per frame (25th percentile) Number of fish per frame (75th percentile) Minimum number of fish per frame Maximum number of fish per frame Frequency of directional change relative to bait	$\frac{(N_{frame})}{Sd(\frac{N_{fishes}}{N_{frame}})}$ $\frac{IQR(\frac{N_{fishes}}{N_{frame}})}{Q_1\left(\frac{N_{fishes}}{N_{frame}}\right)} = F^{-1}(0.25)$ $Q_3\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.75)$ $\frac{min(\frac{N_{fishes}}{N_{frame}})}{max(\frac{N_{fishes}}{N_{frame}})}$ $\frac{fdirectional}{directional}$	Measure of how the fish meanders or move
30 31 32 33 34 35 36 37	(median) Number of fish per frame (standard deviation) Number of fish per frame (interquartile range) Number of fish per frame (25th percentile) Number of fish per frame (75th percentile) Minimum number of fish per frame Maximum number of fish per frame Frequency of directional change relative to bait Directional change	$\frac{(N_{frame})}{Sd(\frac{N_{fishes}}{N_{frame}})}$ $IQR(\frac{N_{fishes}}{N_{frame}})$ $Q_1\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.25)$ $Q_3\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.75)$ $\frac{min(\frac{N_{fishes}}{N_{frame}})}{min(\frac{N_{fishes}}{N_{frame}})}$ $\frac{fdirectional}{Sd(fdirectional)}$	Measure of how the fish meanders or move purposefully around
30 31 32 33 34 35 36 37	(median) Number of fish per frame (standard deviation) Number of fish per frame (interquartile range) Number of fish per frame (25th percentile) Number of fish per frame (75th percentile) Minimum number of fish per frame Maximum number of fish per frame Frequency of directional change relative to bait Directional change variability	$\frac{(N_{frame})}{Sd(\frac{N_{fishes}}{N_{frame}})}$ $IQR(\frac{N_{fishes}}{N_{frame}})$ $Q_1\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.25)$ $Q_3\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.75)$ $\frac{min(\frac{N_{fishes}}{N_{frame}})}{min(\frac{N_{fishes}}{N_{frame}})}$ $\frac{fdirectional}{Sd(fdirectional)}$	Measure of how the fish meanders or move purposefully around the bait
30 31 32 33 34 35 36 37 38	(median) Number of fish per frame (standard deviation) Number of fish per frame (interquartile range) Number of fish per frame (25th percentile) Number of fish per frame (75th percentile) Minimum number of fish per frame Maximum number of fish per frame Frequency of directional change relative to bait Directional change variability Relative angle to bait	$\frac{\langle N_{frame} \rangle}{Sd(\frac{N_{fishes}}{N_{frame}})}$ $IQR(\frac{N_{fishes}}{N_{frame}})$ $Q_1\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.25)$ $Q_3\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.75)$ $\frac{min(\frac{N_{fishes}}{N_{frame}})}{max(\frac{N_{fishes}}{N_{frame}})}$ $\frac{fdirectional}{Sd(f_{directional})}$ $mean(\beta)$	Measure of how the fish meanders or move purposefully around the bait Angle of fish trajectory
30 31 32 33 34 35 36 37 38	(median) Number of fish per frame (standard deviation) Number of fish per frame (interquartile range) Number of fish per frame (25th percentile) Number of fish per frame (75th percentile) Minimum number of fish per frame Maximum number of fish per frame Frequency of directional change relative to bait Directional change variability Relative angle to bait (mean)	$\frac{(N_{frame})}{Sd(\frac{N_{fishes}}{N_{frame}})}$ $IQR(\frac{N_{fishes}}{N_{frame}})$ $Q_1\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.25)$ $Q_3\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.75)$ $\frac{min(\frac{N_{fishes}}{N_{frame}})}{max(\frac{N_{fishes}}{N_{frame}})}$ $\frac{fdirectional}{Sd(f_{directional})}$ $mean(\beta)$	Measure of how the fish meanders or move purposefully around the bait Angle of fish trajectory relative to the bait
30 31 32 33 34 35 36 37 38 39	(median) Number of fish per frame (standard deviation) Number of fish per frame (interquartile range) Number of fish per frame (25th percentile) Number of fish per frame (75th percentile) Minimum number of fish per frame Maximum number of fish per frame Frequency of directional change relative to bait Directional change variability Relative angle to bait (mean) Relative angle to bait	$\frac{(N_{frame})}{Sd(\frac{N_{fishes}}{N_{frame}})}$ $IQR(\frac{N_{fishes}}{N_{frame}})$ $Q_1\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.25)$ $Q_3\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.75)$ $\frac{min(\frac{N_{fishes}}{N_{frame}})}{min(\frac{N_{fishes}}{N_{frame}})}$ $\frac{fdirectional}{Sd(f_{directional})}$ $mean(\beta)$ $median(\beta)$	Measure of how the fish meanders or move purposefully around the bait Angle of fish trajectory relative to the bait
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30 31 32 33 34 35 36 37 38 39 40	(median) Number of fish per frame (standard deviation) Number of fish per frame (interquartile range) Number of fish per frame (25th percentile) Number of fish per frame (75th percentile) Minimum number of fish per frame Maximum number of fish per frame Frequency of directional change relative to bait Directional change variability Relative angle to bait (median) Relative angle to bait variability (standard daviation)	$\frac{\langle N_{frame} \rangle}{Sd(\frac{N_{fishes}}{N_{frame}})}$ $\frac{IQR(\frac{N_{fishes}}{N_{frame}})}{IQR(\frac{N_{fishes}}{N_{frame}})} = F^{-1}(0.25)$ $Q_{3}\left(\frac{N_{fishes}}{N_{frame}}\right) = F^{-1}(0.75)$ $\frac{Min(\frac{N_{fishes}}{N_{frame}})}{Min(\frac{N_{fishes}}{N_{frame}})}$ $\frac{Max(\frac{N_{fishes}}{N_{frame}})}{f_{directional}}$ $\frac{Sd(f_{directional})}{Median(\beta)}$ $\frac{Sd(\beta)}{Max(\beta)}$	Measure of how the fish meanders or move purposefully around the bait Angle of fish trajectory relative to the bait

41	Relative angle to bait variability (interquartile	IQR(<i>β</i>)	
42	Relative angle to bait (25 th percentile)	$Q_1(\beta) = F^{-1}(0.25)$	
43	Relative angle to bait (75 th percentile)	$Q_3(\beta) = F^{-1}(0.75)$	
44	Maximum relative angle to bait	$max(\beta)$	
45	Weighted mean x point	$ar{x}_{weighted}$	Change in x weighted by the bait position
46	Weighted mean y point	$ar{\mathcal{Y}}_{weighted}$	Change in x weighted by the bait position
47	Mean bearing	$ar{ heta}_{bearing}$	average directional angle of the fish for each successive move referenced to the North (y axis)
48	Rayleigh statistic	R _{rayleigh}	Parametric measure of uniformity of the distribution of the bearing angles of a fish
49	Q1	Q ₁	Sum of the cosines of the bearing angle
50	Q2	Q ₂	Sum of the sines of the bearing angle
51	K1	K ₁	concentration parameter of a von Mises distribution (analogous to the normal distribution for circular data)
52	K2	K ₂	concentration parameter of a von Mises distribution (analogous to the normal distribution for circular data)
53	Proportion of q1q2	$\frac{Q_1}{Q_2}$	Mean direction of the bearing angle
54	Likelihood	Ĺ	Measure of how well the data fits a bimodal distribution
55	RAO	R _{rao}	Non-parametric measure of uniformity of the distribution of the bearing angles of a fish
M	Otion Metrics	Mathematical Formula	Description
56	Speed (mean)	mean(d/s)	Planar distance
		incun(u/3)	travellad by the fich

	Denavior al Ivieti its	Ivraulematical Formula	Description
56	Speed (mean)	mean(d/s)	Planar distance
57	Speed (median)	median(d/s)	travelled by the fish
58	Speed variability (standard deviation)	sd(d/s)	per name

59	Speed variability	IQR(d/s)	
	(interquartile range)	(4.1/.)	
60	Acceleration (mean)	$mean(\Delta d/s)$	travelled by the fish
61	Acceleration (median)	$median(\Delta d/s)$	per frame
62	Acceleration peak	$max(\Delta d/s)$	1
63	Distance per move (mean)	mean(d)	Euclidean distance of each successive move
64	Distance per move	median(d)	from one point to
65	Distance per move variability (standard deviation)	sd(d)	
66	Distance per move variability (interquartile range)	IQR(d)	
67	Distance per move (25th percentile)	$Q_1(d) = F^{-1}(0.25)$	
68	Distance per move (75th percentile)	$Q_2(d) = F^{-1}(0.75)$	
69	Minimum distance per move	min(d)	
70	Maximum distance per move	max(d)	
71	Absolute angle (mean)	mean(α)	Angle of fish trajectory relative to a fixed direction (North – navigation)
72	Absolute angle (median)		
73	Absolute angle variability (standard deviation)	$median(\alpha)$	
74	Absolute angle (interquartile range)	$IQR(\alpha)$	
75	Absolute angle (25 th percentile)	$Q_1(d) = F^{-1}(0.25)$	
76	Absolute angle (75 th percentile)	$Q_2(d) = F^{-1}(0.75)$	
77	Minimum absolute angle	$min(\alpha)$	
78	Maximum absolute angle	$max(\alpha)$	
79	Squared net displacement (mean)	mean(R ² n)	Overall change in position of an animal, calculated as the shortest distance from the starting point to the end point of its path, regardless of the path taken
80	Squared net displacement (median)	$median(R^2n)$	
81	Squared net displacement variability (standard deviation)	$sd(R^2n)$	
82	Squared net displacement (interquartile range)	$IQR(R^2n)$	Lowest to highest displacement
83	Squared net displacement (25th percentile)	$Q_1(R^2n) = F^{-1}(0.25)$	

displacement (75th percentile) $Cr(C Y)^{-1}C^{-1}Y^{-1}$ 85Maximum squared net displacement $max(R^2n)$ 86Total squared net displacement $Total R^2n$ 87Change in x direction $mean(\Delta x)$ 88Change in x direction $IQR(\Delta x)$ 90Change in x direction $IQR(\Delta x)$ 91Change in x direction $Q_1(\Delta x) = F^{-1}(0.25)$ 92Change in x direction $Q_1(\Delta x) = F^{-1}(0.25)$ 93Change in x direction $max(\Delta x)$ 94Change in x direction $max(\Delta x)$ 95Change in y direction $median(\Delta y)$ 96Change in y direction $median(\Delta y)$ 97Change in y direction $Q_1(\Delta y) = F^{-1}(0.25)$ 10Change in y direction $Max(\Delta y)$ 2 $Mean x point$ $mean(X_{center})$ 10Change in y direction $max(\Delta y)$ 2 $Mean x point$ $mean(x_{center})$ 10Mean x point $mean(x_{center})$ 10Mean x point $mean(y_{renter})$	84	Squared net	$Q_1(R^2n) = F^{-1}(0.25)$	
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4 O tentry	10 4	Mean y point	$mean(y_{center})$	distance to bait



Supplementary Figure S6: Gap statistics, Elbow and Silhouette method to determine number of behavioral groups.

Datasets	Inter	ested	Uninterested		
Raw bait 2019	82	2	122		
Raw bait 2020	16	16	15	16	
Bio-bait 2020	19)	21	21	

Supplementary Table S7: Stratified 50-50 split of fish count for training (green) and testing (orange).

Supplementary Information S8: The behavior catalog established in this study for Spondyliosoma cantharus.

For *Interested* behaviors: *Appetitive exploratory* occurred for decreasing rate of swimming and distance traveled around the bait with frequent directional changes (frequency of directional change = 18 moves). *Feeding attempt* is characterized by prolonged presence (on average 95 frames) with a close proximity to the bait (< 21 pixels). *Biting* is when fish actively bite the bait with quick movement toward the bait and physical contact. *Nibbling* occurs when fish make smooth contact with the bait as part of object exploration.

For *Uninterested* behaviors: *Fleeing* is characterized by accelerating movement away from other fish or the bait. *Passing by* is when fish undertook escape-like turns, characterized by fast, large-angle turns that involve bending of the entire body with high angular velocity. *Burst swimming* was observed on fast forward swim fish with large bend angles, large distance per move and greater yaw that during slow swimming. *Startle response* corresponds to the fastest escape response, starting with C-shape body position followed by a rapid, straight move away from its current position.



Supplementary Figure S9: Fine-scale behavior trajectories of Spondyliosoma cantharus, extracted from the videos of 2019.



Supplementary Figure S10: DetTracker models evaluation, for the a) mean average precsion (mAP) of the fish detector and b) the tracker using trackEval, available at <u>https://github.com/JonathonLuiten/TrackEval</u>.



Fredicted Class

Supplementary Figure S11: BeClassifier confusion matrix on the two principal behaviors from the groundtruthed bio-bait videos.

Startle —	0	0	0	4	0	1	0	3
Nibble —	1	0	0	0	1	0	1	0
Flee	1	0	3	2	0	1	0	0
Feed Feed	1	0	1	0	0	0	0	0
Fast	0	0	0	15	2	1	0	0
Explore –	2	0	7	3	0	1	0	0
Burst —	0	4	0	0	0	0	0	0
Bite —	1	0	2	0	6	0	0	0
	Bite	Burst	Explore	Predicte	ed Label	Flee	Nibble	Startle

Supplementary Figure S12: BeClassifier confusion matrix on the eight finescale behaviors from the full test set.

Scores	Appetitive Exploratory	Biting	Burst Swimming	Feeding	Fleeing	Nibbling	Passing	Startle Response
Precision	0.54	0.17	1.00	0	0.25	1.00	0.63	1.00
Recall	0.54	0.11	1.00	0	0.14	0.33	0.83	0.38
F1	0.54	0.13	1.00	0	0.18	0.50	0.71	0.55
Balanced Accuracy	0.71	0.51	1.00	0.43	0.55	0.67	0.82	0.69
Average	0.58	0.23	1.00	0.11	0.28	0.63	0.75	0.65

Supplementary Table S13: BeClassifier evaluation scores for the eight finescale behaviors.