Review of Baited Remote Underwater Video (BRUV) in MPAs monitoring

Text S1:

To unveil if baited-video has been efficiently used in MPA's monitoring – i.e., it has gathered stereo-derived indicators such as length and biomass apart from abundance – we performed a review of the published literature. We took the list of papers provided by Langlois et al. 2020, which already covered all peer-reviewed articles published before July 2020 based on the search for keywords: 'baited', 'video', or 'BRUVS'. We chose all the pre-selected papers (n=90) that evaluated fishing impacts, then filtered those that dealt with MPAs' monitoring – i.e., papers that evaluated protection effects of MPAs, or areas permanently closed to fishing (n=80) (Table S1). From these papers, we extracted the following data: i) number of species evaluated – up to 10, or assemblage (≥ 10 species); ii) video – single, or stereo; iii) length measurements included in analysis? – yes, or no; iv) biomass included in analysis? – yes or no; v) study location. We calculated the proportions (%) of single and stereo-video studies out of all baited-video studies from MPA monitoring, and proportions (%) of studies that used length and biomass on all stereo-BRUV studies from MPA monitoring.

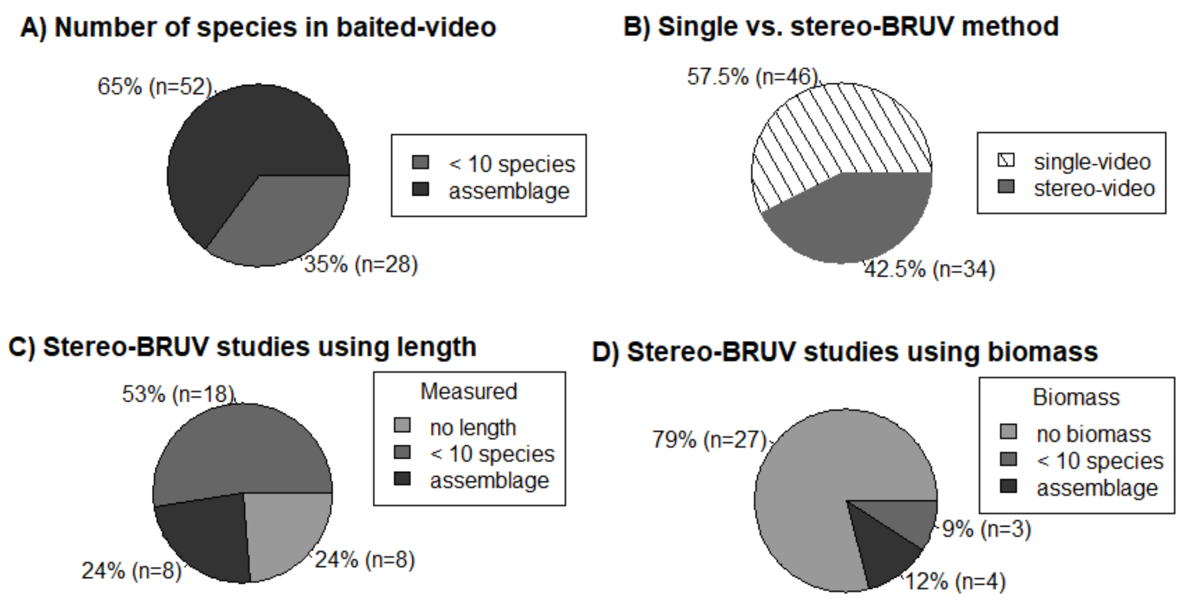

Fig S1. Baited-video in MPAs' monitoring. Proportion (%) of MPAs' monitoring studies that: A) monitored < 10 species or the entire assemblage (≥ 10 species); B) used single-video or stereo-video. Proportion (%) of MPAs' monitoring SBRUV studies that: C) lacked length measurements, measured < 10 species, or measured the entire assemblage, D) lacked biomass, analysed biomass < 10 species, or used biomass of the entire assemblage.

We found that assemblage studies prevailed in MPAs' monitoring (Fig S1-A), and single video prevailed over stereo-video (Fig S1-B). A smaller proportion (1/4) of studies used lengths for the entire assemblage, while more than a half of studies measured few (less than 10) species, and quarter of studies lacked lengths (Fig S1-C). Only 21% of studies analysed biomass indicators (Fig S1-D). Our review suggested that, so far, monitoring of MPAs with baited-video preferred abundance-based assemblage analysis - as single video rarely included measurements, and the use of assemblage stereo-measurements and biomass indicators was less common.

Table S1. The list of papers that used baited-video in MPAs monitoring. Reviewed information: bibliographic reference; number of species: less than 10, or more than 10; video: single, or stereo; length measurements included: yes, or no; biomass included: yes, or no; location; note.

Short reference*	**N° species**	**video**	**length**	**biomass**	**location**	**note**
Stobart et al. 2015	1	single	no	no	Spain	
Denny et al. 2004	1	single	no	no	New Zealand	
Mensinger et al. 2018	1	single	no	no	Australia	
Bond et al. 2012	1	single	no	no	Belize	
Gardner & Struthers 2013	1	single	yes	no	New Zealand	Length from 5 cm gradations
Willis & Babcock 2000	2	single	no	no	New Zealand	
Bond et al. 2019	2	single	no	no	Belize	
Willis et al. 2000	2	single	yes	no	New Zealand	Length from digitized images
White et al. 2013	3	single	no	no	Australia	
Rizzari et al. 2014	3	single	no	no	Australia	
Barley et al. 2017	5	single	no	no	Australia	
Speed et al. 2018	≥ 10	single	no	no	Australia	
Osgood et al. 2019	≥ 10	single	no	no	South Africa	
Denny & Babcock 2004	≥ 10	single	no	no	New Zealand	
Cappo et al. 2007	≥ 10	single	no	no	Australia	
Malcolm et al. 2007	≥ 10	single	no	no	Australia	
Bernard & Götz 2012	≥ 10	single	no	no	South Africa	
Poulos et al. 2013	≥ 10	single	no	no	Australia	
Rees et al. 2013	≥ 10	single	no	no	Australia	
Wraith et al. 2013	≥ 10	single	no	no	Australia	
Kelaher et al. 2014	≥ 10	single	no	no	Australia	
Stevens et al. 2014	≥ 10	single	no	no	England	
Coleman et al. 2015	≥ 10	single	no	no	Australia	
Harasti et al. 2015	≥ 10	single	no	no	Australia	
Howarth et al. 2015	≥ 10	single	no	no	Scotland	

Kelaher et al. 2015b	≥ 10	single	no	no	Australia	
Schultz et al. 2015	≥ 10	single	no	no	Australia	
Gilby et al. 2016	≥ 10	single	no	no	Australia	
Ochwada-Doyle et al. 2016	≥ 10	single	no	no	Australia	
Walsh et al. 2016	≥ 10	single	no	no	Australia	
Harasti et al. 2017	≥ 10	single	no	no	Australia	
Henderson et al. 2019	≥ 10	single	no	no	Australia	
Ortodossi et al. 2019	≥ 10	single	no	no	Australia	
Quaas et al. 2019	≥ 10	single	no	no	Australia	
Robertson et al. 2015	≥ 10	single	no	no	South Africa	
Rees et al. 2018	≥ 10	single	no	no	Australia	
Kelaher et al. 2015a	≥ 10	single	no	no	Australia	
Morales et al. 2019	≥ 10	single	no	no	Chile	
Espinoza et al. 2014	≥ 10	single	no	no	Australia	
Speed et al. 2019	≥ 10	single	no	no	Australia	
Jaiteh et al. 2016	≥ 10	single	no	no	Indonesia	
Whitmarsh et al. 2014	≥ 10	single	no	no	Australia	
Westera et al. 2003	≥ 10	single	no	yes	Australia	
Cappo et al. 2004	≥ 10	single	yes	no	Australia	Length from scaled grids
Heagney et al. 2007	≥ 10	single	yes	no	Australia	Length from reference tubes
Kleczkowski et al. 2008	≥ 10	single	yes	yes	Australia	Length from calibrated images
Goetze et al. 2011	1	stereo	no	no	Fiji	
McLean et al. 2010	1	stereo	yes	no	Australia	
McLean et al. 2011	1	stereo	yes	no	Australia	
Malcolm et al. 2015	1	stereo	yes	no	Australia	
Díaz-Gil et al. 2017	1	stereo	yes	no	Spain	
Harasti et al. 2018b	1	stereo	yes	no	Australia	
Harasti et al. 2019	1	stereo	yes	no	Australia	
Juhel et al. 2019	1	stereo	yes	no	New Caledonia	
Goetze et al. 2018	3	stereo	yes	yes	Solomon Islands	
Goetze & Fullwood 2013	5	stereo	yes	yes	Fiji	
Bornt et al. 2015	6	stereo	yes	no	Australia	
Hill et al. 2018	6	stereo	yes	no	Australia	
Sackett et al. 2013	7	stereo	yes	no	Hawaii	
Moore et al. 2013	8	stereo	yes	no	Australia	
Malcolm et al. 2018	8	stereo	yes	no	Australia	
Tickler et al. 2017	8	stereo	yes	yes	Australia	
Juhel et al. 2018	9	stereo	no	no	New Caledonia	

Watson et al. 2009	≥ 10	stereo	yes	no	Australia	
Goetze et al. 2015	≥ 10	stereo	no	no	Fiji	
Watson et al. 2007	≥ 10	stereo	no	no	Australia	
Harvey et al. 2012	≥ 10	stereo	no	no	Australia	
Fitzpatrick et al. 2013	≥ 10	stereo	no	no	Australia	
Kiggins et al. 2019	≥ 10	stereo	no	no	Australia	
Hill et al. 2014	≥ 10	stereo	no	no	Australia	
Bouchet & Meeuwig 2015	≥ 10	stereo	no	no	Australia	
Prior et al. 2019	≥ 10	stereo	yes	no	Australia	2 species measured
Dorman et al. 2012	≥ 10	stereo	yes	no	Australia	5 species measured
Heyns-Veale et al. 2016	≥ 10	stereo	yes	no	South Africa	
Parker et al. 2016	≥ 10	stereo	yes	no	South Africa	4 species measured
Santana-Garcon et al. 2014	≥ 10	stereo	yes	no	Australia	
Lindfield et al. 2014	≥ 10	stereo	yes	yes	Mariana Islands	
Fitzpatrick et al. 2015	≥ 10	stereo	yes	yes	Australia	
McLaren et al. 2015	≥ 10	stereo	yes	yes	Australia	
Heyns-Veale et al. 2019	≥ 10	stereo	yes	yes	South Africa	

*Long reference:

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Comparison of fishing restrictions in the study area

Table S2. Comparison of fishing restrictions between the national fishing law for continental Portugal (i.e., out of PNSACV), the rocky reefs of the partially protected zone (< ¼ NM; i.e., outside) and the marine reserve of *Ilhotes do Martinhal* (i.e., inside). Restrictions: ✓ equal, **x** different.

<table>
<tr><th></th><th>National fishing law limit</th><th>Outside limit</th><th>National fishing law vs. Outside (< ¼ NM)</th><th>Inside vs. Outside</th></tr>
<tr><td>Commercial fishing[1]</td><td></td><td></td><td></td><td></td></tr>
<tr><td>- Purse seine</td><td>0.25 NM from coast</td><td>Prohibited</td><td>✓</td><td>✓</td></tr>
<tr><td>- Gill and trammel nets</td><td>0.25 NM from coast</td><td>Prohibited</td><td>✓</td><td>✓</td></tr>
<tr><td>- Otter trawl</td><td>6 NM from coast</td><td>Prohibited</td><td>✓</td><td>✓</td></tr>
<tr><td>- Beam trawl[2]</td><td>Strictly regulated</td><td>Prohibited</td><td>✓</td><td>✓</td></tr>
<tr><td>- Beach trawl[3]</td><td>Strictly regulated</td><td>Prohibited</td><td>✓</td><td>✓</td></tr>
<tr><td>- Scallop dredge (sandy bottom)[4]</td><td>Nearshore</td><td>Prohibited</td><td>x</td><td>✓</td></tr>
<tr><td>- Bottom longlines</td><td>Nearshore</td><td>Prohibited</td><td>x</td><td>✓</td></tr>
<tr><td>- Angling (except bottom longlines)</td><td colspan="2">Nearshore</td><td>✓</td><td>x</td></tr>
<tr><td>- Traps</td><td colspan="2">Nearshore</td><td>✓</td><td>x</td></tr>
<tr><td>- Pots</td><td>0.5 NM from coast</td><td>Prohibited</td><td>✓</td><td>✓</td></tr>
<tr><td>Recreational fishing (i.e., shore angling & spearfishing)[5]</td><td></td><td></td><td></td><td></td></tr>
<tr><td><u>Limits per fisher (except the biggest specimen) - weight</u></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Fish and cephalopods</td><td></td><td></td><td></td><td></td></tr>
<tr><td>- Shore angling</td><td>10.0 kg/ day</td><td>7.5 kg/ day</td><td>x</td><td>x</td></tr>
<tr><td>- Spearfishing</td><td>15.0 kg/ day</td><td>7.5 kg/ day</td><td>x</td><td>x</td></tr>
<tr><td>Crustaceans and others</td><td colspan="2">2.0 kg/ day</td><td>✓</td><td>x</td></tr>
<tr><td><u>Limits per fisher (except the biggest specimen) – number of specimens</u></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Fish and cephalopods</td><td></td><td></td><td></td><td></td></tr>
<tr><td>- Shore angling & spearfishing</td><td>Weekends: 2 x Octopus vulgaris/ day</td><td>All days: 2 x Octopus vulgaris/ day</td><td>x</td><td>x</td></tr>
<tr><td>- Spearfishing</td><td>No restrictions</td><td>2 x Labrus bergylta/ day</td><td>x</td><td>x</td></tr>
<tr><td>Commercial & recreational shore angling[6]</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Seasonal closures during the spawning period</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Diplodus sargus</td><td>No restrictions</td><td>1 Feb – 15 March</td><td>x</td><td>x</td></tr>
<tr><td>Diplodus vulgaris</td><td>No restrictions</td><td>1 Feb – 15 March</td><td>x</td><td>x</td></tr>
<tr><td>Labrus bergylta</td><td>No restrictions</td><td>1 March – 31 May</td><td>x</td><td>x</td></tr>
</table>

[1]Portaria n° 1102-G/ 2000; Resolução do Conselho de Ministros n° 11-B/ 2011; [2]Only allowed in some locations in the North-West Portugal, [3]Not practiced in the region (only two valid licenses in Lagos), new licenses not granted (Portaria n° 1102-F/ 2000), [4]Scallop dredges only operate on sandy bottom. [5] Portaria n° 143/ 2009;

Portaria n° 458-A/ 2009; Portaria n° 115-A/ 2011; Portaria n.° 14/ 2014; Despacho 1127-B/ 2019; Decreto-Lei n° 101/ no date [6] Portaria n° 143/ 2009; Portaria n° 458-A/ 2009; Portaria n° 115-A/ 2011; Portaria n° 115-B/ 2011.

Costs of the Stereo Baited Remote Underwater Video (SBRUV) method

Table S3. Fixed and variable costs of stereo-BRUV (approximate costs in EUR in 2018).

Fixed costs (method entry costs)	**EUR**		
SK4 action cameras (4x)	200		
GoPro Hero3 action cameras (2x)	400		
Micro SD cards (6 x 32 GB, min speed class 10)	100		
Extra batteries (6 x)	50		
Stainless steel structure (3 x)	600		
Calibration cube material	50		
iMac computer	1500		
External storage disk 3TB (2x)	200		
Total fixed costs	**3100**		
Variable costs	**EUR/day**	**EUR/sample**	**Notes**
Fieldwork	**490**	**49**	10 valid samples per day
Boat rental or use (including fuel)	290		Approximate costs in 2018
Road transportation (fuel, road fees)	50		Between Sagres and Faro (return)
Personal costs (1 skipper + 2 technicians*)	140		Approximate costs in 2018
Bait	10		
Laboratory	**48**	**27**	4.6 hours of video processing per sample
Personal costs (1 technician)*	48		Approximate costs in 2018

*Personal costs can be reduced by training students/ volunteers.

Mean abundance, length and biomass from stereo-BRUV

Table S4. Abundance of groups and species in protection levels and years of survey. Abundance: mean MaxN ± std. error. Group of species: Legal sized (i.e., commercial above legal minimum landing size), Sublegal sized (i.e., commercial below legal minimum landing size), Non-target (i.e., without commercial interest). Protection level: Inside (i.e., marine reserve), Outside (i.e., partially protected zone ~ fished area). Rarely observed non-target species are not displayed.

	Outside abundance			Inside abundance		
Group or *taxa*	**Both years**	**2016**	**2018**	**Both years**	**2016**	**2018**
Legal sized group	5.5 ± 0.6	3.9 ± 1.5	6.3 ± 0.7	6.4 ± 0.6	4.6 ± 0.7	7.2 ± 0.8
Diplodus sargus	2.6 ± 0.4	1.8 ± 1.0	3.1 ± 0.4	3.5 ± 0.4	2.8 ± 0.5	3.9 ± 0.5
Diplodus vulgaris	1.6 ± 0.2	0.6 ± 0.3	2.0 ± 0.3	1.4 ± 0.3	1.3 ± 0.4	1.4 ± 0.4
Mugilidae	0.5 ± 0.2	0.8 ± 0.5	0.4 ± 0.1	0.3 ± 0.1	0.3 ± 0.2	0.3 ± 0.2
Other legal sized	0.8 ± 0.3	0.8 ± 0.4	0.8 ± 0.4	1.2 ± 0.3	0.2 ± 0.2	1.7 ± 0.3
Sublegal sized group	3.0 ± 0.5	3.4 ± 1.0	2.9 ± 0.5	2.8 ± 0.5	2.8 ± 0.8	2.7 ± 0.6
Diplodus sargus	0.4 ± 0.2	0.9 ± 0.9	0.2 ± 0.1	0.4 ± 0.2	0.3 ± 0.2	0.5 ± 0.3
Diplodus vulgaris	2.3 ± 0.4	2.1 ± 0.7	2.4 ± 0.4	2.0 ± 0.4	2.3 ± 0.8	1.9 ± 0.4
Octopus vulgaris	0.1 ± 0.1	0.2 ± 0.1	0.1 ± 0.0	0.2 ± 0.1	0.3 ± 0.1	0.2 ± 0.1
Other sublegal sized	0.2 ± 0.1	0.2 ± 0.2	0.2 ± 0.1	0.2 ± 0.1	0.1 ± 0.1	0.2 ± 0.2
Non-target group	18.4 ± 2.1	20.8 ± 3.4	17.2 ± 2.6	17.7 ± 2.0	17.2 ± 2.2	18.0 ± 2.7
Centrolabrus exoletus	1.1 ± 0.4	2.5 ± 1.1	0.4 ± 0.1	0.5 ± 0.2	0.8 ± 0.5	0.3 ± 0.1
Coris julis	14.1 ± 1.9	13.3 ± 2.6	14.4 ± 2.5	14.0 ± 1.9	12.8 ± 1.9	14.5 ± 2.6
Ctenolabrus rupestris	0.5 ± 0.1	0.9 ± 0.2	0.3 ± 0.1	0.4 ± 0.1	0.2 ± 0.1	0.6 ± 0.1
Labrus bergylta	0.3 ± 0.1	0.5 ± 0.1	0.2 ± 0.1	0.5 ± 0.1	0.3 ± 0.1	0.6 ± 0.1
Serranus cabrilla	1.8 ± 0.2	2.9 ± 0.4	1.3 ± 0.2	1.8 ± 0.2	2.1 ± 0.4	1.6 ± 0.2
Symphodus spp.	0.2 ± 0.1	0.2 ± 0.1	0.2 ± 0.1	0.4 ± 0.1	0.6 ± 0.1	0.3 ± 0.1

Table S5. Biomass of groups and species in protection levels and years of survey. Biomass: mean sample biomass ± std. error. Group of species: Legal sized (i.e., commercial above legal minimum landing size), Sublegal sized (i.e., commercial below legal minimum landing size), Non-target (i.e., without commercial interest). Protection level: Inside (i.e., marine reserve), Outside (i.e., partially protected zone ~ fished area). Rarely observed non-target species are not displayed.

	Outside biomass (g)			Inside biomass (g)		
Group or *taxa*	**Both years**	**2016**	**2018**	**Both years**	**2016**	**2018**
Legal sized group	1253.3 ± 167.5	1648.1 ± 464.9	1114.0 ± 155.1	1854.3 ± 233.9	1091.1 ± 217.7	2206.5 ± 304.9
Diplodus sargus	406.7 ± 58.6	293.0 ± 110.9	446.9 ± 68.6	734.3 ± 100.9	554.0 ± 140.5	817.5 ± 130.9
Diplodus vulgaris	176.3 ± 26.8	81.1 ± 29.8	209.9 ± 33.0	130.6 ± 29.3	107.5 ± 29.8	141.3 ± 40.8
Mugilidae	341.7 ± 105.9	898.1 ± 346.1	145.4 ± 45.9	183.2 ± 74.7	266.0 ± 146.1	145.1 ± 87.0
Other legal sized	328.6 ± 99.2	375.9 ± 149.6	311.9 ± 124.4	806.1 ± 196.1	163.7 ± 163.7	1102.6 ± 258.0
Sublegal sized group	158.7 ± 32.1	186.7 ± 54.6	148.8 ± 39.3	156.9 ± 28.2	117.7 ± 31.3	175.0 ± 38.4
Diplodus sargus	16.1 ± 7.1	33.4 ± 24.8	10.0 ± 4.0	20.6 ± 12.1	14.5 ± 10.5	23.4 ± 17.2
Diplodus vulgaris	68.2 ± 10.4	62.2 ± 12.1	70.3 ± 13.6	61.6 ± 11.1	57.5 ± 22.9	63.5 ± 12.6
Octopus vulgaris	51.6 ± 21.4	73.3 ± 43.0	44.0 ± 25.0	58.4 ± 24.8	40.8 ± 24.4	66.6 ± 34.7
Other sublegal sized	22.8 ± 13.9	17.8 ± 12.6	24.5 ± 18.4	16.2 ± 10.4	4.8 ± 4.8	21.5 ± 15.0
Non-target group	536.8 ± 82.0	741.2 ± 131.9	464.6 ± 98.8	667.8 ± 74.1	829.9 ± 149.2	592.9 ± 81.6
Centrolabrus exoletus	11.1 ± 4.8	32.0 ± 17.1	3.7 ± 1.6	4.8 ± 1.5	7.7 ± 4.1	3.4 ± 1.2
Coris julis	265.4 ± 36.1	294.5 ± 56.5	255.1 ± 44.8	317.1 ± 36.7	388.2 ± 65.1	284.3 ± 43.8
Ctenolabrus rupestris	8.3 ± 2.0	10.9 ± 3.8	7.4 ± 2.4	7.3 ± 1.6	3.8 ± 2.7	8.9 ± 1.9
Labrus bergylta	144.2 ± 51.7	209.7 ± 81.6	121.1 ± 63.9	197.9 ± 54.3	200.6 ± 107.5	196.7 ± 63.5
Serranus cabrilla	73.5 ± 10.4	144.8 ± 20.5	48.4 ± 8.7	78.1 ± 10.0	106.7 ± 20.1	64.9 ± 10.6
Symphodus spp.	12.3 ± 5.3	7.7 ± 7.7	13.9 ± 6.7	40.0 ± 13.1	75.1 ± 27.2	23.8 ± 13.8

Table S6. Length of the most frequent species in protection levels and years of survey. Length: mean individual length ± std. error. Total length of fish; mantle length of *Octopus vulgaris*. MLS: legal minimum landing size in cm. Group of species: Target (i.e., commercial), Non-target (i.e, without commercial interest). Protection level: Inside (i.e., marine reserve), Outside (i.e., partially protected zone ~ fished area).

	Outside length			**Inside length**			**MLS (cm)**
Species/ *taxa*	**Both years**	**2016**	**2018**	**Both years**	**2016**	**2018**	
Target species							
Diplodus sargus	18.0 ± 0.3	16.1 ± 0.6	18.8 ± 0.3	20.2 ± 0.4	20.3 ± 0.8	20.2 ± 0.5	15.0
Diplodus vulgaris	14.1 ± 0.3	12.5 ± 0.5	14.7 ± 0.3	14.3 ± 0.3	13.3 ± 0.5	14.7 ± 0.4	15.0
Mugilidae	36.5 ± 1.4	37.6 ± 2.2	34.6 ± 0.7	38.1 ± 0.9	37.0 ± 2.1	38.8 ± 0.8	20.0
Octopus vulgaris	11.1 ± 1.1	10.0 ± 1.5	12.2 ± 1.5	9.9 ± 1.1	7.0 ± 1.0	11.4 ± 1.1	12.4
Non-target species							
Centrolabrus exoletus	10.6 ± 0.2	10.8 ± 0.2	10.2 ± 0.5	10.3 ± 0.3	9.9 ± 0.3	10.9 ± 0.5	NA
Coris julis	11.4 ± 0.2	12.7 ± 0.3	10.6 ± 0.2	12.3 ± 0.2	13.3 ± 0.3	11.5 ± 0.3	NA
Ctenolabrus rupestris	11.7 ± 0.5	10.9 ± 0.3	12.2 ± 0.7	10.6 ± 0.5	12.2 ± 1.1	10.4 ± 0.5	NA
Labrus bergylta	25.8 ± 1.7	28.7 ± 2.3	23.8 ± 2.3	28.3 ± 1.8	31.1 ± 5.2	27.4 ± 1.9	NA
Serranus cabrilla	14.5 ± 0.3	15.7 ± 0.4	13.4 ± 0.3	14.1 ± 0.4	15.1 ± 0.7	13.5 ± 0.5	NA
Symphodus spp.	14.5 ± 1.7	17.2 ± NA	14.1 ± 1.9	16.3 ± 1.3	18.1 ± 1.7	14.7 ± 1.7	NA

Protocol for MPAs monitoring using SBRUV

Text S2:

1. **Planning**

1.1 Target organisms

- The horizontal SBRUV allows for sampling of demersal organisms (i.e., demersal fish and cephalopods),

1.2 Sampling locations

- Select multiple locations of comparable habitats (i.e., same type and complexity) and depths in protected zones (i.e., inside) and in control areas (i.e., outside); choose at least two locations per zone/ area,

1.3 Number of sampling sites per zone/ area

- Select sampling sites depending on the total habitat area at each location; always maintain a minimum of 250 m distance between sampling sites – to guarantee samples' independence,
- Preferentially, opt for a balanced design (sampling sites inside : outside – 1:1),

1.4 Number of sampling days

- Plan your field sampling according to the number of SBRUV structures affordable – more structures render more samples per sampling day and reduce fieldwork costs; e.g., three SBRUV structures deployed consecutively from a small vessel render three samples per hour (30 min of video sample + deployment time: 5 min x 3 + recovery time: 5 min x 3 = ± 60 min); the optimal soak times of video samples should be previously assessed based on the study aims (Birt et al. 2021),
- Plan your sampling according to the sampling season: daylight sampling takes place usually between 9 am and 5 pm, but winter days are shorter and summer days longer); e.g., We sampled during 5 to 7 hours per day, and obtained between 15 to 21 samples per sampling day using three SBRUV structures,
- If possible, during each sampling day, collect samples from both protected zones and control areas,
- Plan for sampling during more than one season per year – to reduce seasonal effects,

1.5 Planning for video processing

- Consider that video-samples processing is time consuming, e.g., a 30 min video-sample processing can last 4 hours in average – depending on the abundances; Artificial

Intelligence (AI) should reduce the time requirements in the near future (Ditria et al. 2020),

2. Equipment & bait

2.1 SBRUV and calibration frame

- Build the SBRUV structures – you can follow our model (see Fig 2 of our manuscript) that includes: stainless steel bars and screws to build the main frame, maritime wood bar for placing the cameras, a hand-made bait basket made of a PVC mesh, PVC sticks that support the structure, nylon rope (length 1.5 times the sampling depth), aluminium chain attached to the rope and the structure (by a carabiner), well visible and floatable buoys,
- Label the structures with an ID, e.g., Structure 1, Structure 2, Structure 3,
- Build the calibration frame that will consist of a chessboard pattern and a 3D calibration frame; follow the guide available at http://www.vidsync.org/Hardware (Neuswanger et al. 2016),

2.2 Video equipment

- Purchase cameras and waterproof housings (two cameras per structure), consider maximum sampling depths of the housings (up to 40 m, 60 m etc.); ideally, all the cameras belong to the same brand and type (e.g., GoPros7, or any other action cameras brand),
- Using stainless steel screws, fix the bases of the GoPros/action cameras on the wooden bars; keep 40 cm distance (or more) between cameras, cameras should face the bait basket at an inward 8° angle,
- Purchase batteries based on the planned number of samples per day; an action camera battery usually lasts two video-samples (as max. battery life is cca 90 mins),
- Purchase micro-SD cards (e.g., 32 GB, or 64 GB); cards of speed class 30 (UHS speed 3) are fast enough to record full HD (1080 p x 30 frames); the number of SD cards required depends on the planned number of samples per day of sampling, on the average size of a video-sample in GB (e.g., 30 min of video sample + 10 min of video for deployment, recovery and trouble solving), and on the average size of calibration videos in GB (max 10 min of video per sampling day per SBRUV structure),
- Purchase extra (back-up) cameras, batteries, and SD cards – as equipment gets damaged,

- Label (ID) cameras and housings, then use the same housing for a camera throughout sampling – this will save time on calibration processing (see below),

2.3 Bait

- Use the same bait, in the same proportions and quantity throughout the entire sampling; usually oily fish serve as the best bait (*Sardina pilchardus*); e.g., We used a mixture of cca 200 g of *Sardina pilchardus*, *Trachurus trachurus*, *Scomber colias*, and *Mytilus galloprovincialis*, which resulted as the best bait based on a previous local study, but bait should be tested and adapted to the study aims,
- Calculate the amount of bait required, then purchase and store the bait in a freezer in separate bags that contain bait for one sampling day,

2.4 Video processing hardware & software

- Here, we suggest using VidSync (Neuswanger et al. 2016) – a freeware that works on Mac, which provides a cheaper solution compared to commercial software,
- We recommend using a monitor with a large screen (cca 24”, i.e., either an iMac, or an external monitor),

3. Sampling preparation

3.1 Sampling sheets and checklist

- Create and print sampling sheets (Fig S2),
- Create and print a sampling checklist (Fig S3), verify taking all the checklist items to fieldwork,
- Charge the GPS with uploaded sampling points,

3.2 Stereo-BRUV preparation

- Charge all batteries,
- Format all SD cards (i.e., check they are empty),
- Check cameras’ settings: full HD (1080 x 30 frames), medium field of view, display to shut down after cca 30 secs, LED light off, date and time set, etc.,
- Using a screwdriver, tighten the housings into the bases on the wooden bars,
- Put the cameras, ready for sampling, into the housings; in the sampling sheets, fill in what housing ID and camera ID belong to what structure ID, and what camera ID contains what SD card ID (Fig S3),

SBRUV - sampling sheets

Date: Place: Writing:

Cameras' set up

Structure 1: Left cam n°: Right camera n°:

Structure 2: Left camera n°: Right camera n°:

Structure 3: Left camera n°: Right camera n°:

SD card used during sampling

Cam n°: Cam n°: Cam n°:

Cam n°: Cam n°: Cam n°:

Deployment n°	Structure n°	Sampling point	GPS	Time of deployment	Notes
1					
2					
…					

Fig S2. Example of SBRUV sampling sheet

Stereo-BRUV sampling - checklist

SBRUV equipment

- 3 x baited underwater video structures
- 6 x cameras in waterproof housings + back-up cameras in housings
- 12 x SD cards 32 GB speed 30 + back-up SD cards
- batteries for cameras
- cloth to dry housings
- 3 x ropes, chains with carabiners, buoys
- 6 x PVC sticks + back-up sticks
- tools: screwdriver, hammer
- calibration frame
- wetsuit or swimming dress, and water-shoes (to perform calibration)

Bait related

- bait for the sampling day(s)
- 3 x bait baskets + back-up baskets
- tie-wraps (to fix the bait baskets)
- tools: bait chopper, knife

Sampling site related

- charged GPS + spare batteries
- sampling sheets, pencils
- watch or mobile phone

Fig S3. Example of SBRUV sampling checklist

4. Fieldwork

4.1 Calibration videos

- The calibration procedure consists of synchronisation, 3D calibration and distortion correction; a detailed description is available at http://www.vidsync.org/User+Guide#Recording_footage (Neuswanger et al. 2016),
- For video synchronisation purposes, clap hands above the bait basket at the beginning of each recording,
- Record an underwater video of the 3D frame – simultaneously by both cameras, before and after each day of sampling - to guarantee measurements,
- Record an underwater video of the chessboard pattern – separately by each camera, before sampling - to allow for distortion correction; if the camera remains in the same housing throughout the entire sampling, one good quality video is enough (no need to repeat),

4.2 Samples collection

- A crew should consist of an experienced skipper, and at least two persons that perform the sampling, e.g., experienced research technician and a volunteer/ student,
- Before boarding the vessel, attach the chains with ropes and buoys to the SBRUV structures, and mount the PVC sticks, if not done previously,
- Before deployment, chop the unfrozen bait into a paste, fill in the bait baskets, and use the tie-wraps to fix them,
- Before deployment, switch on both cameras and clap hands for synchronisation,
- Deploy the first SBRUV structure at the pre-defined sampling site, write down the structure ID, sampling site ID/ GPS point and the time of deployment; then proceed to the next sampling point to deploy the next SBRUV,
- When waiting to recover the structures, stay away from the sampling point to not disturb fish,
- Once sampling time passed, recover the SBRUV structure, and switch off the cameras to save battery time,
- If a housing moved during sampling (e.g., after hitting a rock), put it back to the initial position and tighten it using a screwdriver – an after-sampling calibration will apply to the next samples to guarantee measurements, while the affected sample might only serve for abundance data or may need to be discarded,
- Change bait after each deployment, as it degrades fast,
- Use a cloth to dry the housings before removing cameras to change batteries and SD cards,

- Change batteries based on the time and size of your recordings, e.g., after each two deployments for 30 min video-samples, note that changing batteries usually resets the date and time,

- Change SD cards, according to the time and size of your recordings; in the sampling sheets, fill in the new SD card IDs inserted into each camera,

5. Video processing

5.1 Data storage

- Following the fieldwork, make two copies (main and back-up) of the recorded videos,

- Organize the videos in hierarchical folders: e.g., date of sampling/ SBRUV structure ID/ camera ID/ SD card ID/ video ID; note that a folder called 'SD card ID' will create a permanent link to the information in the sampling sheets,

- Some types of cameras automatically split videos (e.g., 10 mins, or 30 mins); merge the videos' parts that correspond to the same sample (e.g., use iMovie on Mac),

- For easy identification, rename the merged video samples, e.g., SiteID_cameraID_YYYYMMDD, and the calibration videos, e.g., Calib_before_cameraID_YYYYMMDD,

5.2 Using VidSync

- Watch the VidSync video tutorial: http://www.vidsync.org/VidSync+video+tutorial, and/or follow the written guide: http://www.vidsync.org/User+Guide#Loading_and_navigating_videos_in_VidSync (Neuswanger et al. 2016),

5.3 Processing of calibration videos

- Process the calibration stereo-videos: create a new project, load left and right cameras' calibration videos, synchronise them using the hands clapping, perform a distortion correction for each camera, and a 3D calibration for both cameras; you will have to provide the software with the coordinates of the 3D calibration frame, and fill in the refraction correction settings,

- Once completed, save the distortion correction outputs for each camera, and the 3D calibrations for both cameras,

5.4 Processing of video samples

- Process the stereo-video samples: create a new project, load left and right cameras' videos, synchronise them using the hands clapping, upload the correct distortion correction for each camera, and the correct 3D calibration for both cameras,

- Create new object types that will include the identified species/ taxa; you can then download this list, and upload it on your next sample project,
- Create new event types, one for MaxN (abundance) and one for Length measurements; you can then download this list, and upload it on your next sample project,
- Play both stereo-videos simultaneously, and stop the video to add a new MaxN event for a species: tag all individuals of the species visible in both cameras, and write down your MaxN count in the column called 'notes',
- Each time you suspect a higher number of individuals of a species than previously tagged, stop the video, and add a new MaxN event for the species,
- You can create several MaxN events with the same number of individuals of a species, as some MaxN events might be more suitable for measurements than other events – e.g., fish appear closer to the cameras,
- After processing the entire video sample, select the final MaxN frame for each species – i.e., the frame with the highest number of individuals of the species,
- For each species, select the stereo-measurements frame – i.e., a frame with the highest number of 'measurable' individuals of a species – i.e., a frame where the total fish length, or mantle length of cephalopod is visible in both cameras, and individuals swim under less than a 25° angle,
- Perform stereo-measurements by adding a new Length event for a species, then measure each individual; to increase accuracy, perform at least two length measurements for each individual; write down the lengths in the 'notes' column, separated with a /,
- Measure mantle length for cephalopods, and fork or/and total length for fish; fork length may provide more precise measurements in species with forked or lunate caudal fin, but note that regional length-weight relationships may only exist for total lengths,
- Once finished, save a copy of the sample project – in this copy, keep only the final MaxN and Length events for each species; export the project output as a csv that can serve to create the database, or copy your data manually into an excel sheet,
- For each sample, you can categorise habitat complexity visually, e.g., using a scale from 1 (least complex, flat habitat) to 4 (the most complex habitat, with big boulders) (see our manuscript for more details),

5.5 Data analysis

- Classify species by their commercial status – target, or non-target,
- Classify target species based on a reference size: i.e., legal minimum landing size (legal sized, or sublegal sized), or size at maturity; analyse separately individuals/ groups below and above the reference size,
- Calculate biomass of each species based on length-weight relationships,
- Analyse the following variables based on protection (protected zones, control areas) and habitat complexity: richness (and/or other diversity indices), species and groups abundance (MaxN), length and biomass; only analyse length at species level,
- When before data are available, compare these variables before and after protection,
- When before data are missing, but data from several years after protection are available: compare time trends after protection between protected zones and control areas,
- Choose appropriate statistical methods for each dataset – univariate for richness, species, and community variables (e.g., ratios, GLMs, or parametric or non-parametric tests), and multivariate for community variables (e.g., PERMANOVA, nMDS, SIMPER),

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