Table S6. Description of the kelp assemblages from eastern to western Azores.

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| Eastern Azores |
| *Formigas Bank* | *L. ochroleuca* kelp beds were found on irregular bedrock sometimes in the vicinity of coarse biogenic sand patches. The densest stands were observed at approximately 55 m depth. The algae covered rocky surfaces of low to intermediate slope, becoming sparser in steep sloping faces. In some locations kelp was found on heterogeneous coarse sediments comprising biogenic gravels, scattered pebbles and small boulders. Some stipes sticking out of biogenic sands suggest that sedimentation may follow the development of the sporophytes over firmer substrate.Measurements of by-caught specimens indicated stipes reach 1 m height and blades attain 1.5 m length (Fig. 2 F). Although no area-based sampling could be performed on climatic stands, we estimate that maximum densities reached several specimens per square meter if we use the perceived size of the specimens as a scale proxy. |
| *Santa Maria island* | The DDC deployments performed on this island shelf in 2018 revealed *L. ochroleuca* in depths between 49 m and 79 m. Colonized substrates included irregular bedrock, cobbles on biogenic sand and dense rhodolith beds. Blades reaching 129 cm length and stipes of up to 4 cm were measured from specimens collected by SCUBA divers. Sparse *Phyllariopsis* were observed on soft bottoms at 74 m depth. |
| Passage between Eastern and Central Azores |
| *Dom João de Castro Bank* | Surveys extending down to 60 m depth on this shallow seamount summit did not reveal any kelp occurrence. |
| Central Azores |
| *Terceira island* | A fully-grown *L. ochroleuca* specimen was by-caught on a reef off Terceira’s west coast during the 2005 ARQDAÇO fishery monitoring cruise. An ROV exploration of the reef flank near the specimen collection site was conducted in 2008 covering depths between 27 and 80 m. A single kelp specimen with a short stipe and an elongated unsplit robust frond at 72 m depth (similar specimen in Fig. 3 C). |
| *Graciosa island* | Following anecdotal kelp reports from a local diving club and a kelp specimen by-caught during a fishing monitoring cruise kelp beds were located by divers off the island’s northern shore. The upper-most occurrences were at 31 m depth, which constitutes the shallowest record for the archipelago so far. DDC deployments showed further occurrences in deeper bedrock areas down to 71 m depth. Recent reports from the local diving club suggest that the species also occurs off the eastern shore. A few dozen *L. ochroleuca* specimens of up to 17 cm stipe height and 102 cm blade length were sampled.Stands of *Phyllariopsis* were observed growing on small boulders mixed with sand at 49 m and on a rocky incline adjoining a sandy area at 53 m. |
| *São Jorge island* | An anecdotal kelp occurrence was communicated to IMAR-DOP/UAz researchers in the early 2000’s regarding a potential kelp bed observed off São Jorge northern shore but no validation has been attempted so far. |
| *Pico and Faial islands* | No kelp has been so far recorded around these islands despite the hundreds of dives performed around them every year, both by researchers from IMAR-DOP/UAz and by a number of local diving clubs. Nineteen ROV and DDC deployments executed on rocky and mixed seabed between 40 m and 80 m depth have not revealed any kelp occurrences either. The close collaboration of the research community with the local fishermen has not produced any by-catch records either. |
| *Princesa Alice Bank* | No kelp has been recorded in over 60 regular SCUBA dives conducted down to 45 m depth on the small infralittoral reefs that top this large offshore bank. A dive with rebreathers extending down to 79 m depth during the 2014 GUE expedition did not reveal any occurrences either. No by-catch records exist for the area despite this being one of the two most heavily exploited fishing banks in the Azores. |
| Western Azores |
| *Corvo and Flores islands* | No kelp has been recorded in the two western-most islands of the Azores in over 300 conventional SCUBA dives down to 40 m depth and 22 DDC casts (from 50 to 80 m). Fifteen interviews with local divers, fishermen, and other sea-goers provided no evidence of kelp occurrence either. |