

Can Kelp Grow Off Hastings? Light, Water and Six Sites

Oct 23, 2026 · @Chris

The short answer

Sugar kelp can probably grow off Hastings, but only in a narrow band: on rock from chart datum (CD) to about 2 m below it, on the outer edge of the reefs 500–700 m from shore. That is marginal, not hopeless, and it is the same kind of patchy habitat where kelp survives at Holywell today.

- **The open Channel is not the problem.** 1–3 km out, Hastings has the 3rd-clearest water of six sites from Falmouth to Dover, and clearer water than Holywell in 11 of 13 measures.
- **The shoreline fringe is the problem.** Within 500 m of shore, Hastings has the muddiest water of the six over the year (median 37 mg/L), driven by summer; in winter it is no worse than Holywell.
- **Rain and storms are not the problem; summer heat is a growing one.** Hastings is one of the driest, calmest sites. But 75 years of volunteer shore readings show the shallows now peak at 20–22 °C most summers, well above sugar kelp's 17 °C stress level, and the satellites miss it.
- **The big unknown is silt settled on the rock.** Satellites cannot see it, and it could stop spores settling. Only fieldwork will answer that.

This report is a desk study: ten years of satellite, model and weather data, the Environment Agency's water samples, 40 years of Landsat images, the 1995 English Nature kelp map and the national species records. Nothing has been measured in the water yet.

What sugar kelp needs

Light is the limit that matters on this coast: sugar kelp survives only where at least about 1% of surface light reaches the seabed. We used sugar kelp thresholds throughout, not the giant kelp figures common in the Californian literature, because sugar kelp is the species HKP will plant.

Need	Threshold used	What it means
Survival edge	1% of surface light (range 0.7–1.4%)	Below this depth, plants slowly starve
Healthy growth	Midday light at least 70 $\mu\text{mol photons/m}^2/\text{s}$ (saturation point, I_k)	Plants grow at close to full speed
Break-even light	13 $\mu\text{mol photons/m}^2/\text{s}$ (compensation point, E_c)	Photosynthesis just balances respiration
Best temperature	10–15 °C	Fastest growth
Stress temperature	17 °C and above	Tissue loss reported in Norwegian studies
Lethal temperature	23–24 °C	Plants die

To turn murky water into a depth, we converted suspended mud (SPM) into light loss using the UK coastal formula of Devlin et al. (2009), then applied the Beer–Lambert law. The standard satellite light product (K_d490) was rejected: off Hastings it claimed 1% light reached 25 m, which is not credible in water this muddy.

$$K_d = 0.188 + 0.064 \cdot \text{SPM} \quad z_{1\%} = \frac{\ln(100)}{K_d}$$

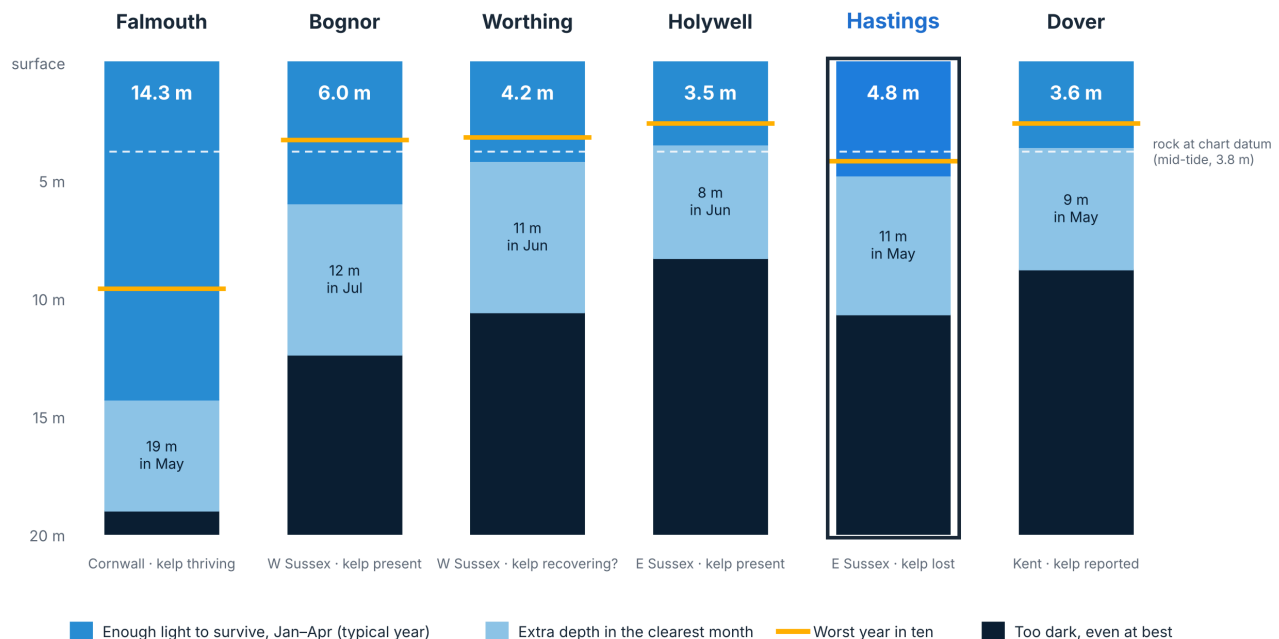
The tide matters too. Hastings has a large tidal range (about 7.4 m on springs), so rock at CD sits under roughly 3.8 m of water on average. The depth figures below correct for this.

Six sites compared offshore

A kilometre or more out, Hastings water lets light reach about 4.8 m in a typical late winter, more than Holywell (3.5 m), where kelp still grows.

How deep does enough light reach for kelp?

Six sites along the Channel, west to east. Each column is the sea 1–3 km offshore, surface at the top. 2016–2025.



Light limit = 1% of surface light (sugar kelp). Source: Copernicus Marine 1 km satellite SPM, Devlin et al. 2009 conversion, 2016–2025 · Hastings Kelp Project, Oct 2026

Each column is the sea 1–3 km offshore, surface at the top. The orange line marks the worst winter in ten: Hastings' sits deeper than any other site from Bognor to Dover. The dashed line is rock at chart datum at mid-tide.

We compared Hastings with five sites: Falmouth (thriving kelp, a clear-water benchmark), Bognor and Worthing (the Sussex Kelp Recovery Project coast), Holywell (kelp present) and Dover (kelp reported). Hastings ranks 2nd or 3rd on every offshore measure, and its worst year (4.2 m) is better than four other sites' worst years. January to April matters most: it is the darkest stretch, and the time young kelp needs light to grow.

The near-shore problem

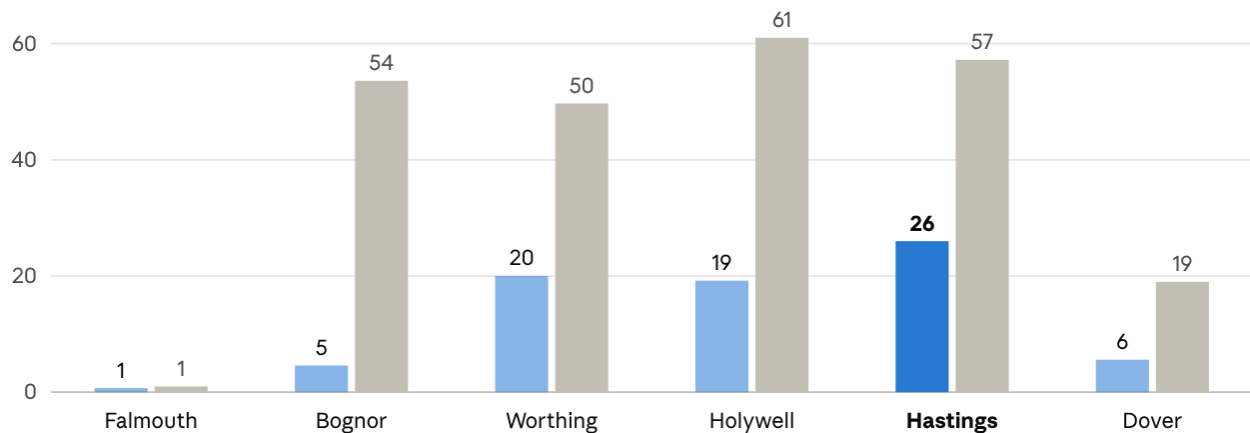
Within 500 m of the shore, Hastings carries about ten times more mud than 2 km out, the steepest jump of any site, and the extra mud comes in the growing season.

Near shore, Hastings is muddiest in summer; in winter every Sussex site is murky

Suspended mud in the first 500 m from shore, typical (median) month, mg/L, 100 m satellite data 2020–2025 (lower = clearer)

■ Apr–Sep (growing season)

■ Oct–Mar



Copernicus Marine North-West Shelf 100 m coastal SPM · 2020–2025, about three clear passes a month

In summer the Hastings fringe carries 26 mg/L against Holywell's 19, so the shallows stay murky just when kelp should be growing fastest. In winter, storms make every Sussex site murky, and Hastings (57 mg/L) is slightly clearer than Holywell (61). Falmouth and Dover show no near-shore jump, so it is not just a satellite artefact near the coast.

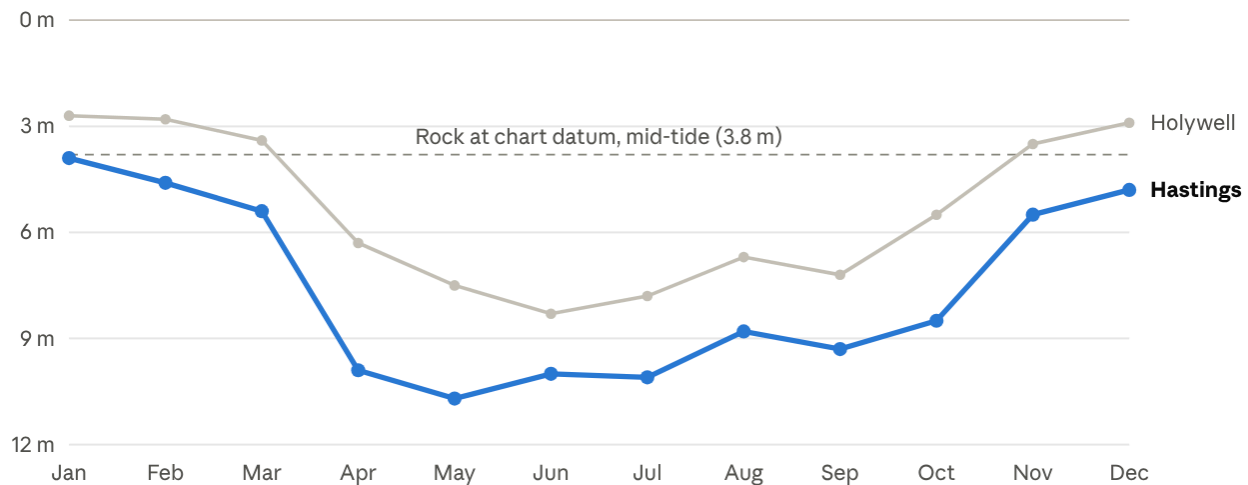
What this means for depth: in winter, the inner 500 m lets enough light for survival reach only about 1 m down. At 0.5–1.5 km out it reaches about 3.5 m. The reefs off Hastings run 500–700 m out, so their outer edge sits just beyond the worst of the fringe.

How deep kelp can live

Winter decides it: from December to March, survival light reaches only 4–5 m below the surface off Hastings, against 9–10 m from April to October.

In winter, survival light reaches only 4–5 m off Hastings, just past rock at chart datum

Depth where 1% of surface light remains, 1–3 km offshore, average month 2016–2025 (lower on the chart = deeper)



Copernicus Marine 1 km satellite SPM, Devlin et al. (2009) conversion · monthly averages 2016–2025; chart datum from Hastings tidal levels

Because the tide rises and falls 3–7 m twice a day, the seabed's depth keeps changing. Averaging light over the tide, the deepest rock that gets enough survival light in a typical January to April is:

Distance from shore	Survival depth below chart datum, typical January–April
1.5–3 km	about 2.3 m (about 1.8 m in the worst year)
0.5–1.5 km	about 1.2 m
0–0.5 km	above chart datum: only the low shore and pools

So the habitable band is roughly chart datum to 1–2 m below it. In practice, that means rock that is uncovered or nearly uncovered on the biggest spring tides.

Other pressures: heat, rain, storms

If Hastings lost its kelp, the cause should be something Hastings has and the others don't. Rain and storms fail that test; near-shore mud passes it. Heat does not explain the loss either, as every Sussex site shares it, but it is a rising pressure in the shallow band where kelp could live.

Pressure (2016–2025)	Falmouth	Bognor	Worthing	Holywell	Hastings	Dover	Verdict for Hastings
Warmest sea day, satellite 1–3 km out (°C)	18.9	20.6	20.5	19.9	19.8	20.2	Shore hit 22.1 °C (see below)
Days at 20 °C or more, per year (satellite)	0	5.8	4.0	0	0	2.4	Satellite misses shore peaks
Rain (mm per month)	92	75	76	73	68	67	Not the problem
Storm days per year (waves 2.5 m+)	12	16	21	28	19	11	Not the problem
Average wave height (m)	0.76	0.83	0.85	0.89	0.78	0.73	Not the problem
Mud within 500 m of shore (mg/L)	0.7	8.9	29.0	29.6	37.1	9.9	Stands out

With less rain than its neighbours, the likeliest mud source is the soft, clay-rich cliffs between Rock-a-Nore and Fairlight, not rivers. Near-shore mud tracks wave height (correlation 0.61) more than rain (0.35): waves stir up what the cliffs supply.

The Environment Agency's same-day samples in 2025 agree with the satellites offshore: on five shared sampling days, Hastings water was as clear as or clearer than Holywell's every time (turbidity 1.0–6.4 against 1.0–12.8 NTU).

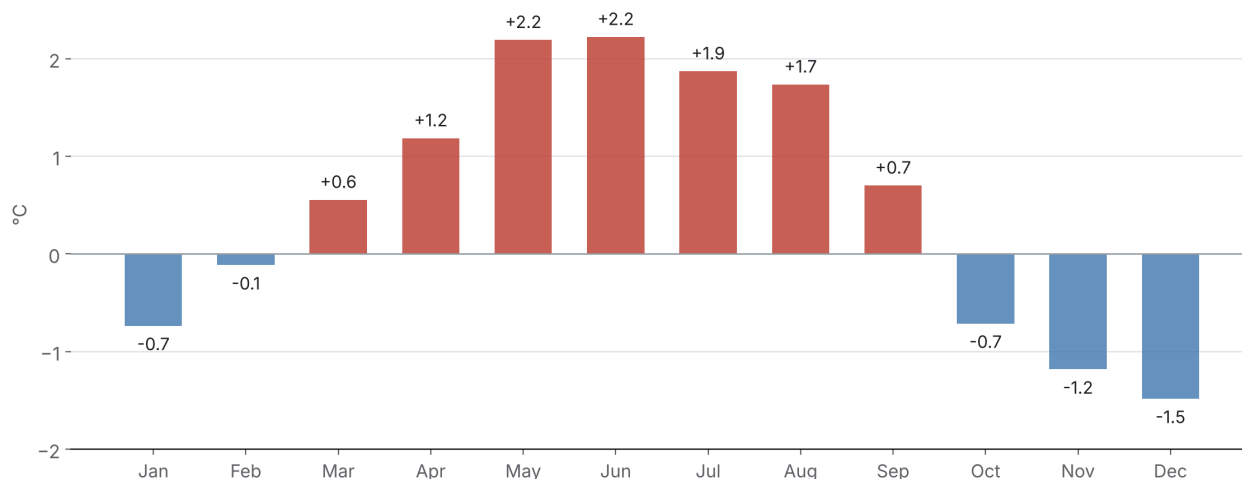
Shore readings tell a hotter story

The Hastings Weather Volunteers have recorded sea temperature at Hastings every month since 1950. Their shore readings agree closely with the satellite overall (correlation 0.96), but they run up to 2.2 °C hotter at the summer peak and up to 1.5 °C colder in winter. That is the signature of shallow water, which a 5 km satellite pixel cannot see.

In summer, shore peaks run about 2 °C hotter than the satellite sees

Highest monthly reading at the Hastings shore minus the satellite's highest daily value, average of 2016–2025

Above zero = the shore is warmer · satellite = open water 1–3 km out



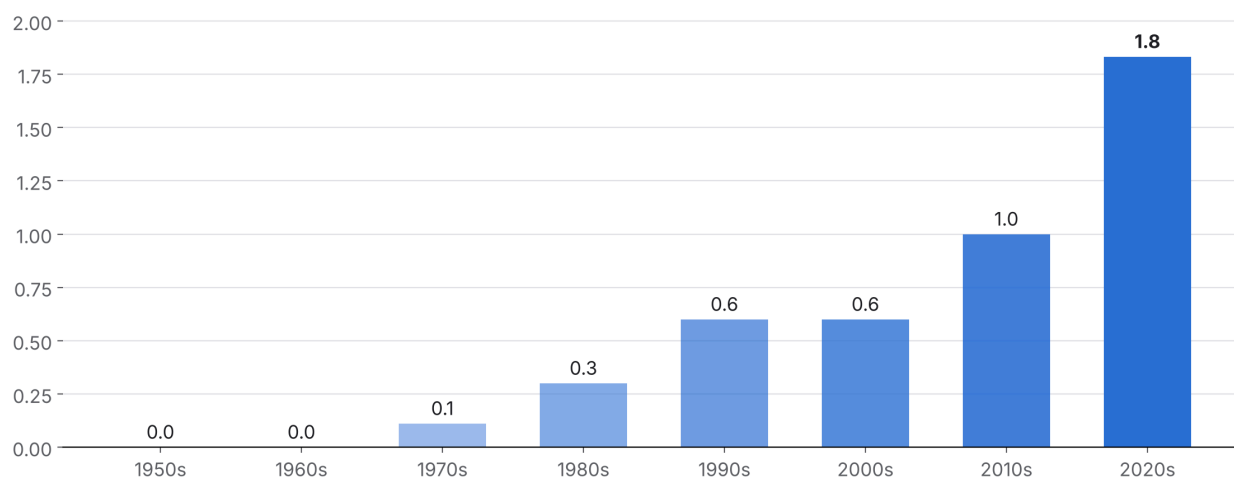
Source: Hastings Weather Volunteers sea temperature record (HKP_Master_Sea_Temperature_Database.xlsx); Copernicus Marine IFREMER SST L4 · Hastings Kelp Project, Oct 2026

- **Peaks the satellite missed:** 22.1 °C in August 2025, 22.0 °C in August 2024 and 21.8 °C in July 2019. In 2016–2025 the shore reached 20 °C or more in 18 months; the satellite's warmest day never did.
- **A clear warming trend:** 0.29 °C per decade overall and 0.31 °C per decade in summer ($p < 0.001$). An average August has risen from 17.2 °C in the 1960s to 19.6 °C in the 2020s.

Months peaking at 20 °C+ have gone from none to almost two a year

Average number of months per year in which the highest shore reading reached 20 °C or more, Hastings, by decade

Sugar kelp stress begins around 17 °C; lethal at 23–24 °C · 2020s = 2020–2025

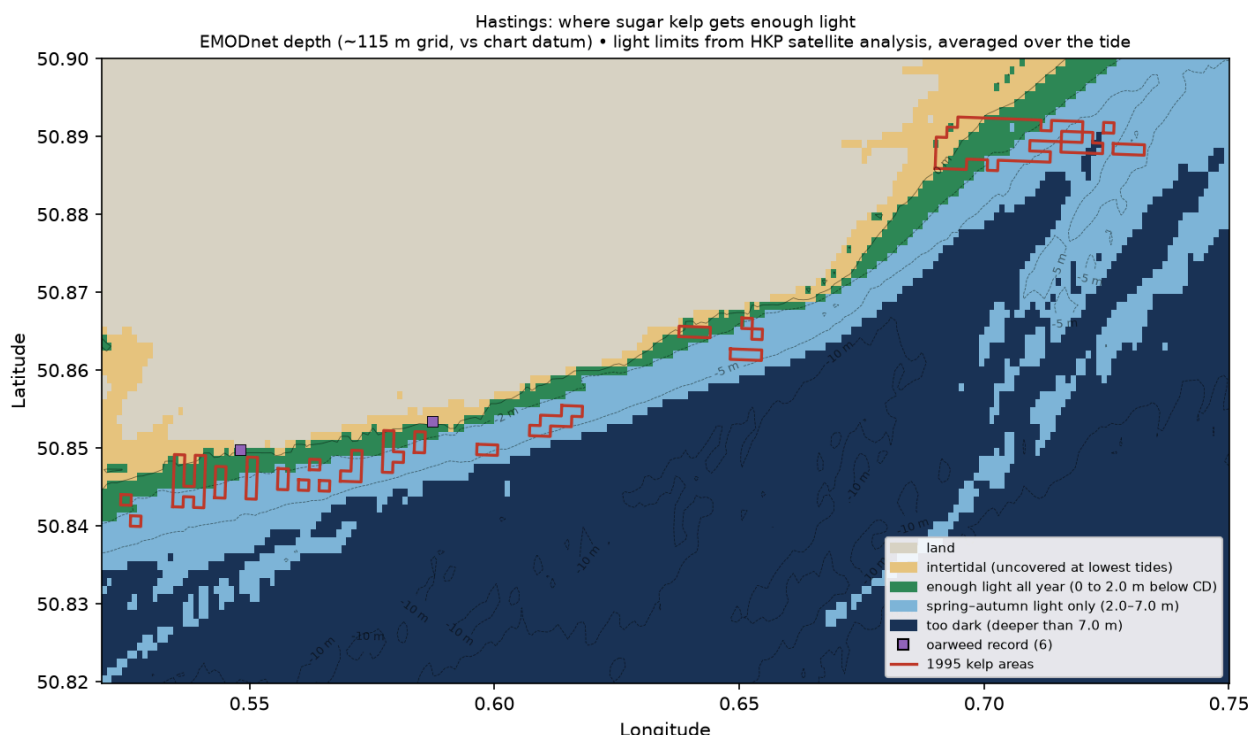


Source: Hastings Weather Volunteers sea temperature record (HKP_Master_Sea_Temperature_Database.xlsx) · Hastings Kelp Project, Oct 2026

This squeezes the target zone from both sides: too dark below about 2 m under chart datum, and increasingly hot at the top. It argues for planting on the deepest rock the light allows. Still to confirm with the volunteers: where and how the readings were taken, and whether the site or the thermometer has changed.

What history says

Kelp did grow here: the 1995 English Nature survey mapped 22 kelp and algae reef patches off Hastings, mostly in the band where today's light is enough.

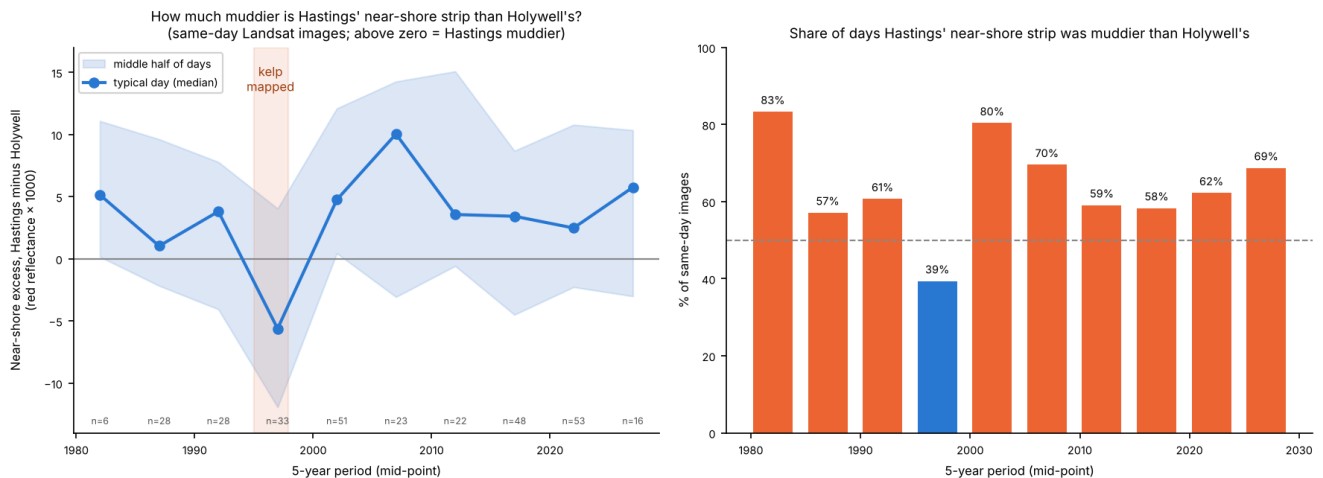


First estimate. Depth grid is coarse near the shore; check rock outcrops and depths on Admiralty charts. Records: NBN Atlas.

Green = enough light all year (CD to 2 m below CD); light blue = spring-autumn only (2–7 m); navy = too dark. Red outlines = 1995 kelp areas. Purple squares = museum oarweed specimens. Depth grid is about 115 m, so check it against Admiralty charts.

- **The 1995 patches sit where the model says they should.** Median depth 2.1 m below CD; 35% lie in the all-year zone and 53% in the spring-autumn zone. Holywell's 1995 patches sit slightly deeper (median 2.6 m), in murkier water, and kelp is still there.
- **No change in 40 years of Landsat.** Hastings' near-shore mud shows no trend from 1984 to 2025 (Spearman rho -0.04 , $p = 0.41$). The coast has not got muddier; the kelp went for some other reason, or a combination.

- **One odd window.** On same-day images, Hastings' shoreline strip was muddier than Holywell's on 57–83% of days in every five-year period except 1995–99 (39%), the years the kelp was mapped. Only 33 images, so treat it as a lead, not proof.
- **Hardly anyone has looked.** The national records (NBN Atlas) hold just six kelp records for Hastings: oarweed specimens collected in 1834–1888. There are no modern dive or shore records at all.



Landsat 4–9, 1984–2025, 308 days with both sites clear. Above zero (left) or above 50% (right) = Hastings muddier near shore.

Holywell, May 2026: kelp in the rock pools

On 21 May 2026, HKP volunteers walking the chalk platform at Holywell at low tide found live sugar kelp in the low-shore rock pools. No diving was needed. It is the first sugar kelp recorded at Holywell since 1986 and is not yet on the national database.





The crinkled (bullate) central band and wavy, undivided blade identify sugar kelp, Saccharina latissima.



- **Young plants.** Blades of about 30–50 cm in late May fit plants that settled last winter, so Holywell is still producing new kelp in silty water.

- **The right depth.** Plants found on foot sit at or just above chart datum, exactly where the light analysis says kelp can live.
- **Murky water.** The pools are milky with chalk silt and sediment coats the rock, yet the blades look clean and healthy.
- **Still to record:** grid reference, time of low water, pool depth and plant count. A revisit this autumn will show whether the plants survived summer pool temperatures.

What it means for HKP

The evidence points to recruitment limitation, not a hostile sea: adult plants could survive, but too few spores arrive and settle on muddy rock. Outplanting 15 cm juveniles skips exactly that bottleneck, which is why the pilot is worth doing.

A realistic target: Holywell-like patchy kelp, between CD and 2 m below CD, on the outer edge of the reefs, plus deep low-shore rock pools. Not a forest, not yet.

What to measure next, in order:

- ☐ Shore-based Secchi readings with the home-made white disk, near shore and further out, through winter.
- ☐ A rock-pool kelp search on the Hastings platforms at the next big spring low, using the Holywell method.
- ☐ A Holywell revisit on the same tide: are the May plants still there after summer?
- ☐ Submit the Holywell May 2026 sighting to iRecord or Seasearch.
- ☐ Look for settled silt on the reef: a finger-swipe test and photos at low water.
- ☐ Natural England consultation for the pilot outplanting (no sea work until approved).

Keep it honest: satellites see only the surface, only on clear days, and the strip right by the shore is their weakest spot. The thresholds come from Norwegian, North Sea and Arctic sugar kelp. Every number here should be treated as a hypothesis for the Secchi disk to test.

Sources and data

All raw data, scripts and the working spreadsheet (HKP_Light_Research_Master.xlsx) are in the HKP folder.

- [Copernicus Marine: Atlantic ocean colour, 1 km, multi-year \(SPM, Kd490, chlorophyll\)](#)
- [Copernicus Marine: North-West Shelf 100 m coastal turbidity and SPM](#)
- [Devlin et al. \(2009\), estimating Kd from suspended sediment in UK coastal waters](#)
- Copernicus Marine: IFREMER Atlantic SST reanalysis (to Nov 2025); North-West Shelf wave reanalysis

- Open-Meteo archive (ERA5): rainfall and wind
- Environment Agency Water Quality Archive: turbidity samples, 2025
- Hastings Weather Volunteers: monthly shore sea temperature (mean, maximum, minimum), 1950–2025
- USGS Landsat Collection 2 Level-2, via Microsoft Planetary Computer: 1984–2025
- EMODnet Bathymetry; EMODnet Seabed Habitats, Sussex Coast lifeforms map (BioMar/Envision for English Nature, 1995–97)
- NBN Atlas: kelp occurrence records within 6 km of each site
- Fortes & Lüning (1980): sugar kelp light saturation