

Reporting Summary

Nature Portfolio wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Portfolio policies, see our [Editorial Policies](#) and the [Editorial Policy Checklist](#).

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a Confirmed

- | | | |
|-------------------------------------|-------------------------------------|--|
| ☐ | ☒ | The exact sample size (n) for each experimental group/condition, given as a discrete number and unit of measurement |
| ☐ | ☒ | A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly |
| ☐ | ☒ | The statistical test(s) used AND whether they are one- or two-sided
<i>Only common tests should be described solely by name; describe more complex techniques in the Methods section.</i> |
| ☐ | ☒ | A description of all covariates tested |
| ☐ | ☒ | A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons |
| ☐ | ☒ | A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals) |
| ☐ | ☒ | For null hypothesis testing, the test statistic (e.g. F , t , r) with confidence intervals, effect sizes, degrees of freedom and P value noted
<i>Give P values as exact values whenever suitable.</i> |
| ☒ | ☐ | For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings |
| ☒ | ☐ | For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes |
| ☐ | ☒ | Estimates of effect sizes (e.g. Cohen's d , Pearson's r), indicating how they were calculated |

Our web collection on [statistics for biologists](#) contains articles on many of the points above.

Software and code

Policy information about [availability of computer code](#)

Data collection detailed description of data collection can be found in the method.

Data analysis Custom codes used for analysis are available on GitHub https://github.com/amirharduf/FFDB_Sleep

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Portfolio [guidelines for submitting code & software](#) for further information.

Data

Policy information about [availability of data](#)

All manuscripts must include a [data availability statement](#). This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our [policy](#)

Data behind the main and supplementary figures are provided in the GitHub repository https://github.com/amirharduf/FFDB_Sleep. Large raw video datasets are available from the corresponding author upon request. Source data are provided as a Source Data file.

Research involving human participants, their data, or biological material

Policy information about studies with [human participants or human data](#). See also policy information about [sex, gender \(identity/presentation\), and sexual orientation](#) and [race, ethnicity and racism](#).

Reporting on sex and gender

Reporting on race, ethnicity, or other socially relevant groupings

Population characteristics

Recruitment

Ethics oversight

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☐ Life sciences ☐ Behavioural & social sciences ☒ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see nature.com/documents/nr-reporting-summary-flat.pdf

Ecological, evolutionary & environmental sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	This field study quantified natural sleep behaviour in wild Cassiopea spp populations within their native shallow-water habitat. Behavioural sleep metrics were assessed through direct observation of pulsation rates and activity patterns across day and night cycles in situ. Each jellyfish constituted an independent experimental unit, and behavioural measurements were used to define sleep states based on established pulsation thresholds.
Research sample	Organism: Cassiopea spp
Source: Wild population at Key Largo, Florida
Sex: Not determined
Age/developmental stage: Not determined
Sampling rationale: C. andromeda is a diurnal symbiotic jellyfish inhabiting shallow tropical waters and is an established model for sleep-like behavioural studies in cnidarians. The sampled population represents natural coastal reef-adjacent populations of the species in the Florida Keys.
Manipulations: None beyond behavioural observation and pulse counting.
Sampling strategy	Animals were selected directly from the surrounding natural population and observed individually. Sample size was chosen to ensure sufficient statistical power for behavioural comparisons.
Total animals observed: 662Animals
Data collection	Behavioural data were collected manually by RA and AH using direct visual observation. Pulsation rates were measured by counting the number of contractions per minute using a manual counter, clock, pen, and paper. Measurements of body size using a ruler. All measurement were recorded at hourly intervals across both daytime and nighttime periods.
Timing and spatial scale	Collection period: May 19 – May 28, 2022
sampling area: approximately 1 square km.
Water depth: approximately 2 m
Data exclusions	No data exclusions were reported.
Reproducibility	Measurements were performed across multiple days and involved a large sample of independently observed individuals, with consistent behavioural trends observed across observation periods.
Randomization	Animals were selected opportunistically from the population but each animal was treated as an independent observational unit.
Blinding	Blinding was not applicable due to the direct behavioural observation design
Did the study involve field work?	☒ Yes ☐ No

Field work, collection and transport

Field conditions	Field observations were conducted in shallow coastal waters under natural environmental conditions. During the sampling period, water temperature averaged 26.8°C, salinity was 31.5 ppt, and light intensity ranged from approximately 400 to 1500 PPFD during daytime. Observations spanned natural diurnal conditions with a photoperiod from 07:00 to 19:30.
Location	Field work was conducted at a shallow marine site in Key Largo, Florida, USA. Coordinates: Latitude: 25.103344235446343 Longitude: -80.43989485201203 Water depth: approximately 2 m The site represents the natural habitat of <i>Cassiopea</i> spp within a coastal reef-associated environment.
Access & import/export	Jellyfish were observed directly in situ and were not removed from the environment for this field experiment. No transport across borders or international shipment occurred for this component of the study.
Disturbance	The study involved non-invasive visual observation and manual pulse counting. Physical contact with animals was performed only after pulsation counting. Any transient disturbance was minimized by maintaining a fixed observation distance and limiting handling time per individual.

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☐	☒ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology and archaeology
☐	☒ Animals and other organisms
☒	☐ Clinical data
☒	☐ Dual use research of concern
☒	☐ Plants

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Antibodies

Antibodies used	anti-γH2AX (GTX127342, GeneTex); anti-DsRed (Takara); anti-mouse IgG488 (Invitrogen); anti-rabbit IgG 647 (Invitrogen)
Validation	anti-γH2AX (GTX127342, GeneTex), manufacture's website : https://www.genetex.com/Product/Detail/Histone-H2A-XS139ph-phospho-Ser139-antibody/GTX127342 anti-DsRed (Cat# 632543, Takara), manufacture's website : https://www.takarabio.com/products/antibodies-and-elisa/fluorescent-protein-antibodies/red-fluorescent-protein-antibodies anti-mouse IgG488 (Invitrogen), manufacture's website : https://www.thermofisher.com/antibody/product/Goat-anti-Mouse-IgG-H-L-Cross-Adsorbed-Secondary-Antibody-Polyclonal/A-11001 anti-rabbit IgG 647 (Invitrogen) manufacture's website : https://www.thermofisher.com/antibody/product/Goat-anti-Rabbit-IgG-H-L-Highly-Cross-Adsorbed-Secondary-Antibody-Polyclonal/A-21245

Animals and other research organisms

Policy information about [studies involving animals](#); [ARRIVE guidelines](#) recommended for reporting animal research, and [Sex and Gender in Research](#)

Laboratory animals	Nematostella vectensis : WT, NvClk ^{-/-} and tg(NvElav1b:orange) ^{+/-} ; <i>Cassiopea andromeda</i>
Wild animals	<i>Cassiopea</i> spp
Reporting on sex	Gender was not considered in this study
Field-collected samples	No field-collected samples in this study

Ethics oversight

No ethical approval required to study cnidarian

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Plants

Seed stocks

The study did not involve plant

Novel plant genotypes

The study did not involve plant

Authentication

The study did not involve plant