Supplemental Information for: "Population densities predict forebrain size variation in the cleaner fish *Labroides dimidiatus*"

Authors: Zegni Triki[1*†], Elena Levorato[1*], William McNeely[1], Justin Marshall[2] & Redouan Bshary[1]

Affiliation:

[1]Institute of Biology, University of Neuchâtel, Emile-Argand 11, 2000 Neuchâtel, Switzerland

[2]Queensland Brain Institute, University of Queensland, St Lucia QLD 4072, Australia

*authors contribute equally

[†]**Correspondence to:** Zegni Triki, phone number: +41795244902, email: zegni.triki@unine.ch

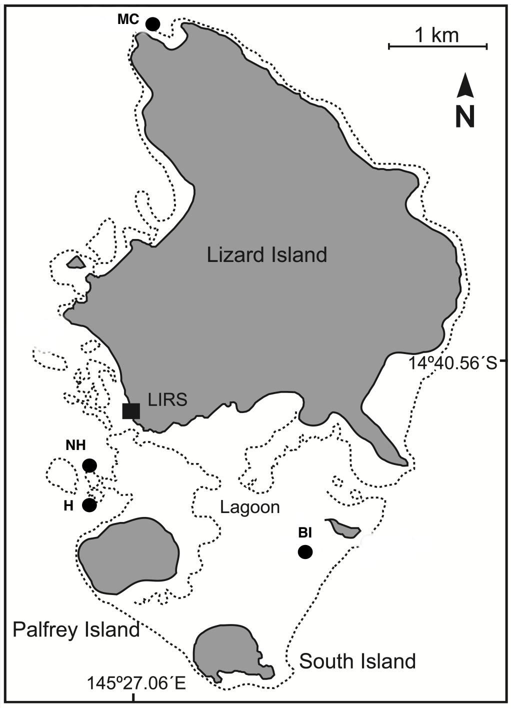

Figure S1. Map of Lizard Island group. The map is showing the detailed location of the four study reef sites at Lizard Island, wherein the filled circles refer to: Bird Islet (BI), Horseshoe (H), Mermaid Cove (MC), and Northern Horseshoe (NH). Depth at the study sites ranges from 1 to 16 m.

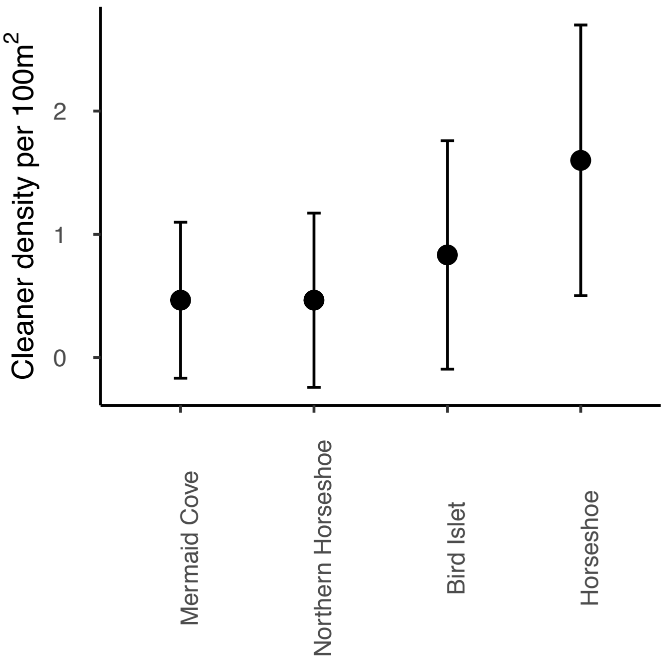

Figure S2. Social complexity of the studied sites. Mean and standard deviation of cleaner density per study site. There were (n=10) transect data points per site, except for Bird Islet where there were (n=8) due to its relatively small surface area. Number of cleaners sampled for brain tissue from each site was: (n=5) from Mermaid Cove, (n=1) from Northern Horseshoe, (n=7) form Bird Islet, and (n=7) from Horseshoe.

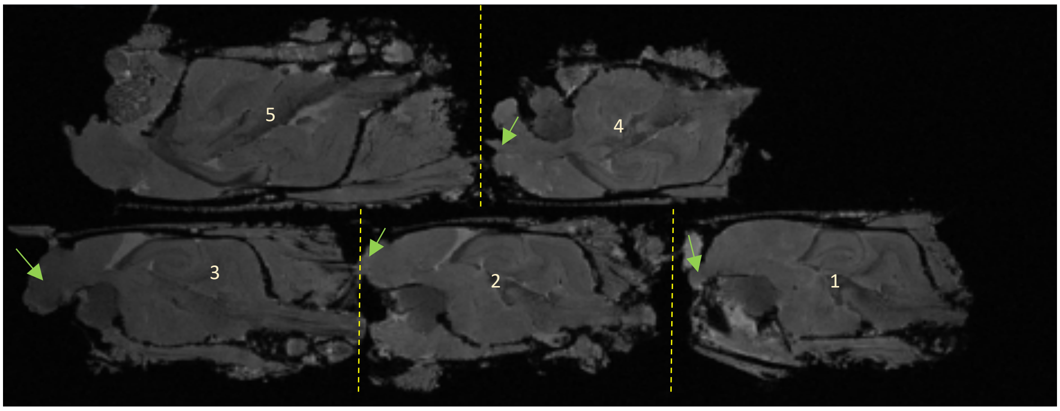

Figure S3. An example of one of the four group MRI scans. The spatial distribution of the five glued brains on the plastic sheet helped in identifying them later. Green arrows indicate where the distortion occurred in the telencephalon part in most brains due to dissection artefact. In this figure, brains 1, 2, and 3 are upright, whereas brain 4, and 5 are upside down. The images are depicting sagittal view of the brains.

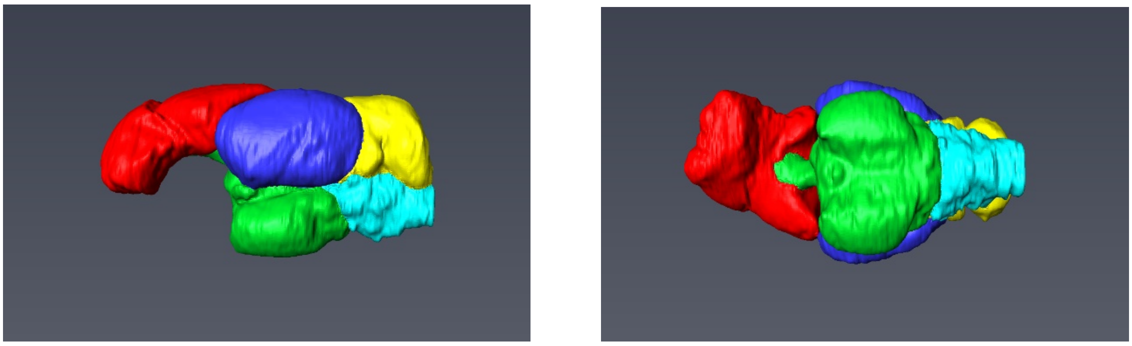

Figure S4. An example of distorted telencephalon (in red) due to brain dissection methods. Left image is a lateral view of the brain, while the right image is a dorsal view of the brain. Color codes are: The brain is subdivided to six major brain areas, depicted in different colors: telencephalon (in red), olfactory bulbs (in pink), diencephalon (in green), mesencephalon (in blue), rhombencephalon (in yellow) and brain stem (in light blue). Images were prepared with the AMIRA software by E. L.

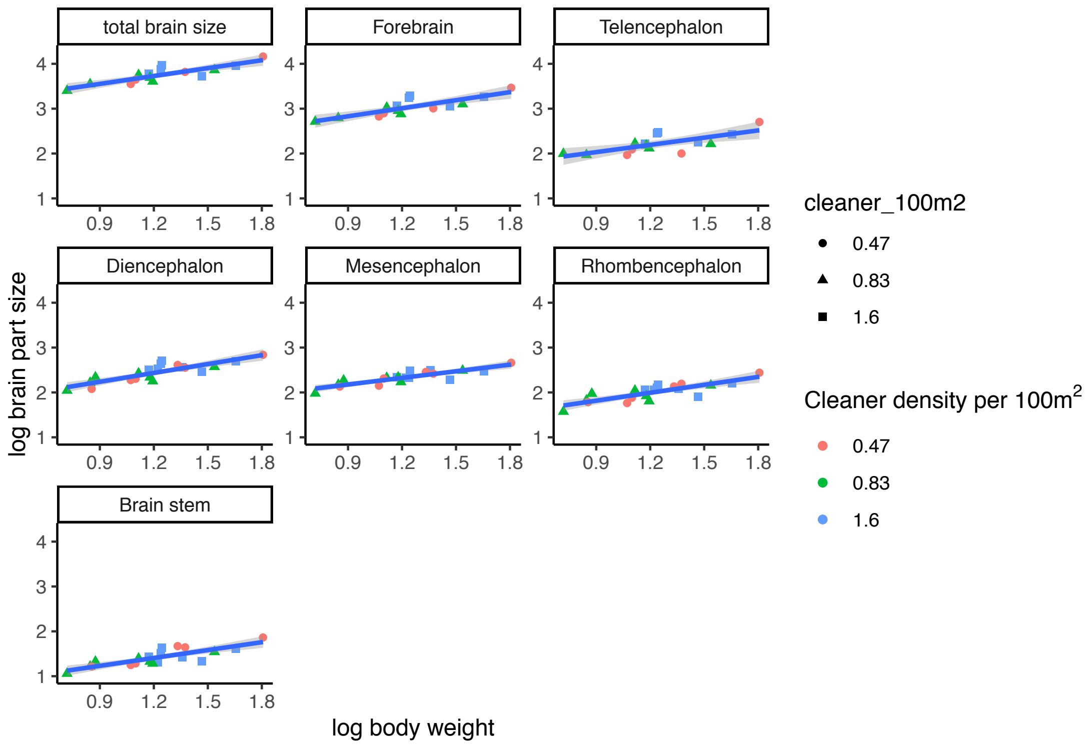

Figure S5. Linear regression relationship between log brain size parts and log body size. Color and shape indicate the three levels of cleaner density at the four study sites. Forebrain size is telencephalon plus diencephalon size. Total brain size includes: telencephalon, diencephalon, mesencephalon, rhombencephalon, and brain stem.

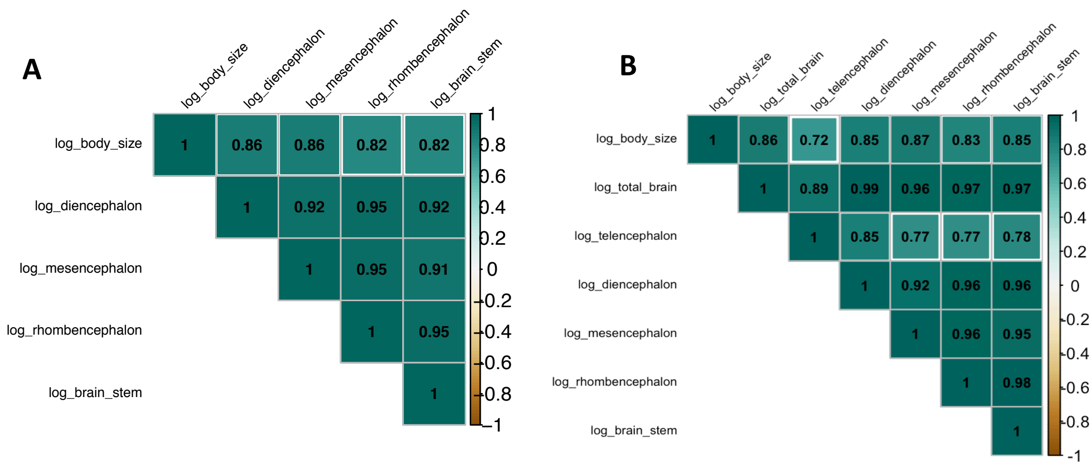

Figure S6. Correlation matrix of the brain part sizes and body size. (**A**) correlation matrix without telencephalon part (N=20). (**B**) correlation matrix with telencephalon part (N=15; 5 brain measurements missing due to non-available data for the telencephalon). Measurements are log-transformed. Depicted values are correlation coefficients (r), while color grade and size of the square indicate the magnitude of the correlation from -1 to 1.

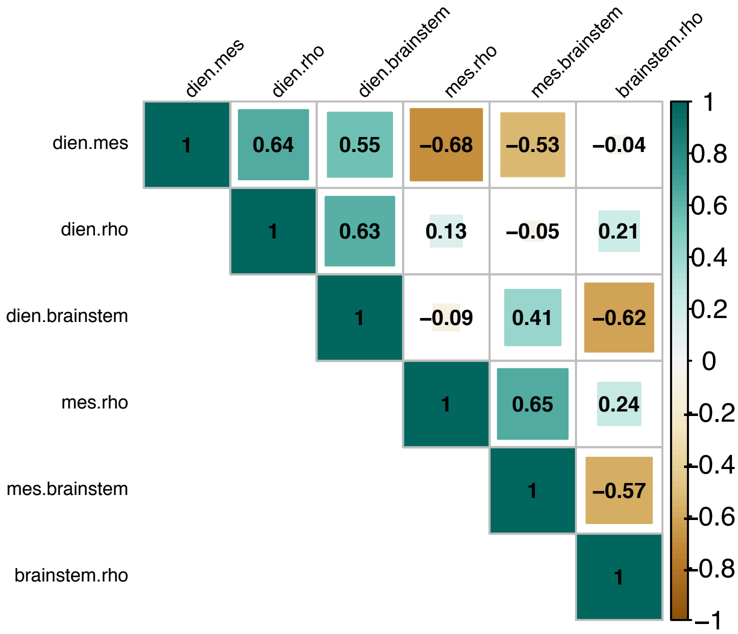

Figure S7. Correlation matrix of the size ratio of brain main areas. Depicted values are correlation coefficients (r), while color grade and size of the square indicate the magnitude of the correlation from -1 to 1. Significance level was set at $| r | \geq 0.5$. This threshold was suggested by Krehbiel [1], where a linear relationship might exist between two correlators if: $| r | \geq 2 / \sqrt{n}$ where "n" is the sample size, here (n=20). Dien: diencephalon, mes: mesencephalon, rho: rhombencephalon, brainstem: brain stem. N=20

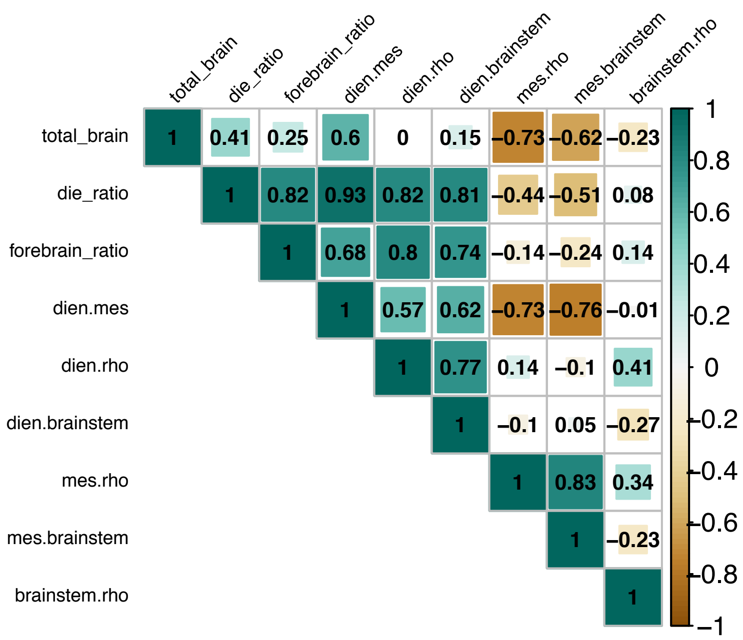

Figure S8. Correlation matrix of the size ratio of brain main areas and total brain size. Depicted values are correlation coefficients (r), while color grade and size of the square indicate the magnitude of the correlation from -1 to 1. Dien: diencephalon, mes: mesencephalon, rho: rhombencephalon, brainstem: brain stem. N=15

References:

1. Krehbiel TC. 2004 Correlation Coefficient Rule of Thumb. *Decision Sciences Journal of Innovative Education* **2**, 97–100. (doi:10.1111/j.0011-7315.2004.00025.x)