Electronic Supplementary Material (ESM) to Manuscript:

Title: The structure of a bottlenose dolphin society is coupled to a unique foraging cooperation with artisanal fishermen.

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ESM1: Additional details on our sampling effort

Table S1: Summary of each season of our sampling effort in Laguna, southern Brazil. Although the sampling effort was slightly higher during spring seasons, the number of cooperative and non cooperative dolphins sighted did not change, even during the mullet seasons (autumns).

	Effort (days)	Effort (h)	Observation (h)	Sighted groups	Coop. dolphins	Non-coop. dolphins
Spring (2007/2008)	26	104	48,3	161	15	18
Summer (2008/2009)	22	81	33,6	109	15	19
Autumn (2008/2009)	23	90	36,5	116	16	18
Winter (2008/2009)	22	84	34,5	115	14	17

ESM2: Spatial distribution of cooperative and non-cooperative dolphins.

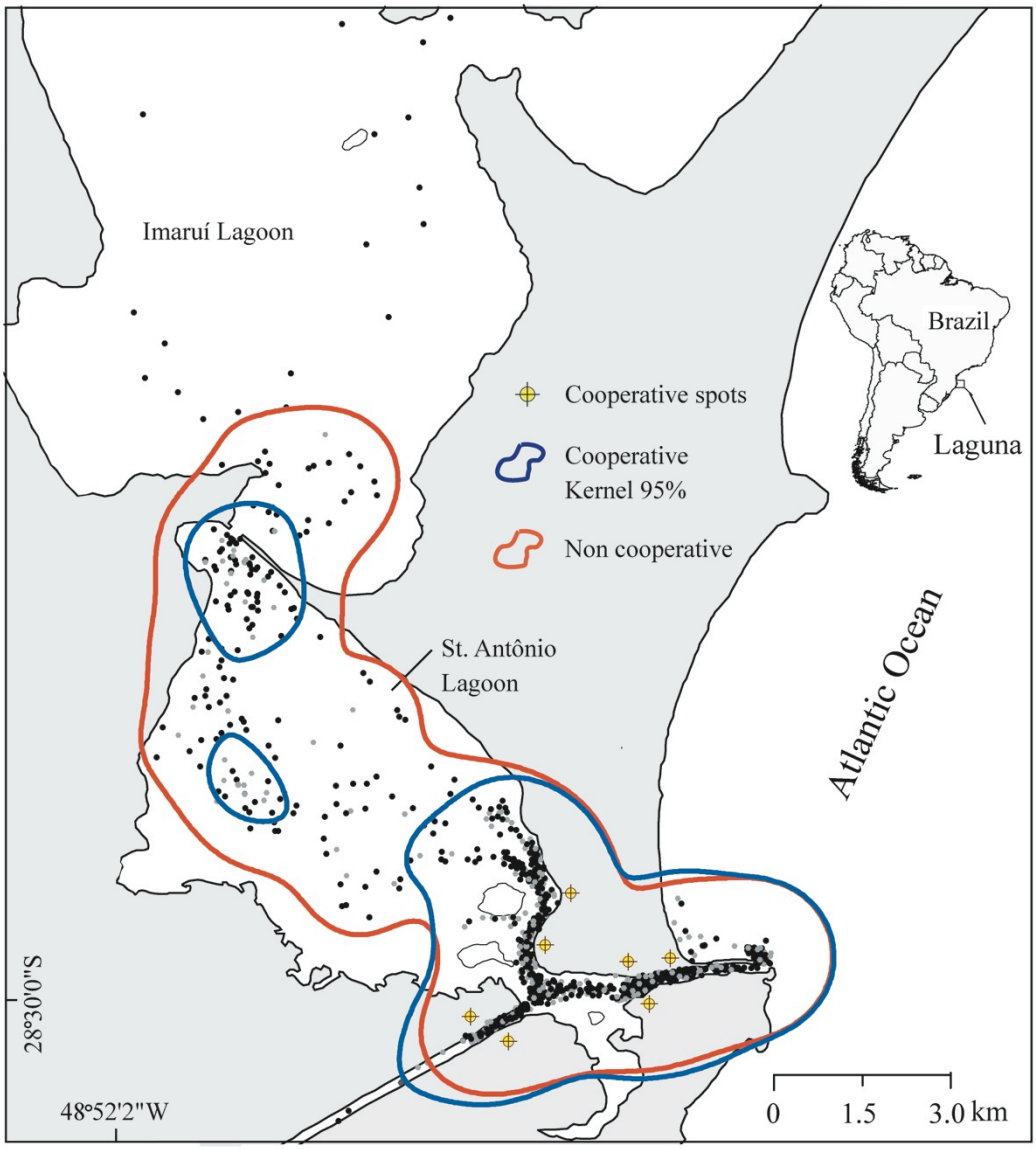

Figure S2: Home ranges for each foraging class and the location of the main cooperative fishing spots. Grey points represent the locations of observations of cooperative dolphins' and black points the non-cooperative dolphins. To estimate home range we used fixed kernel method with a 95% contour line calculated from encounter locations of all individuals from each class. The blue contour line represents the 95% home range of cooperative dolphins and red contour line represents the 95% home range of non-cooperative dolphins. The least square cross-validation

method was used to estimate the bandwidth value (the smoothing parameter) [RS1]. The overlap between the ranging behaviour of cooperative and non cooperative dolphins excludes the possibility of the modular structure resulting solely from spatial segregation between classes. Although non-cooperative dolphins extended their movements over a wider area, this slight spatial variation might be an outcome of different foraging tactics, or a plausible driver for the patterns of association. We also correlated the dyadic association matrix with a spatial overlap matrix, based on the following home range overlapping index (OI):

$$OI = (S_{ij}/S_i) \times (S_{ij}/S_j),$$

where Sij is the size of the area of overlap between the home range of dolphins i and j, Si is the size of the area used by individual i, and Sj is the size of the area used by individual j [RS2]. In this case, the kernel method with a 95% contour line was also used to estimate the individuals' home ranges. A significant but weak correlation between the social and the spatial matrices was found (see main text). Finally, we highlight that the areas close to the cooperative spots are within the core area for all dolphins, including non-cooperatives.

ESM3: Further details on Newman modularity technique and an additional clustering analysis.

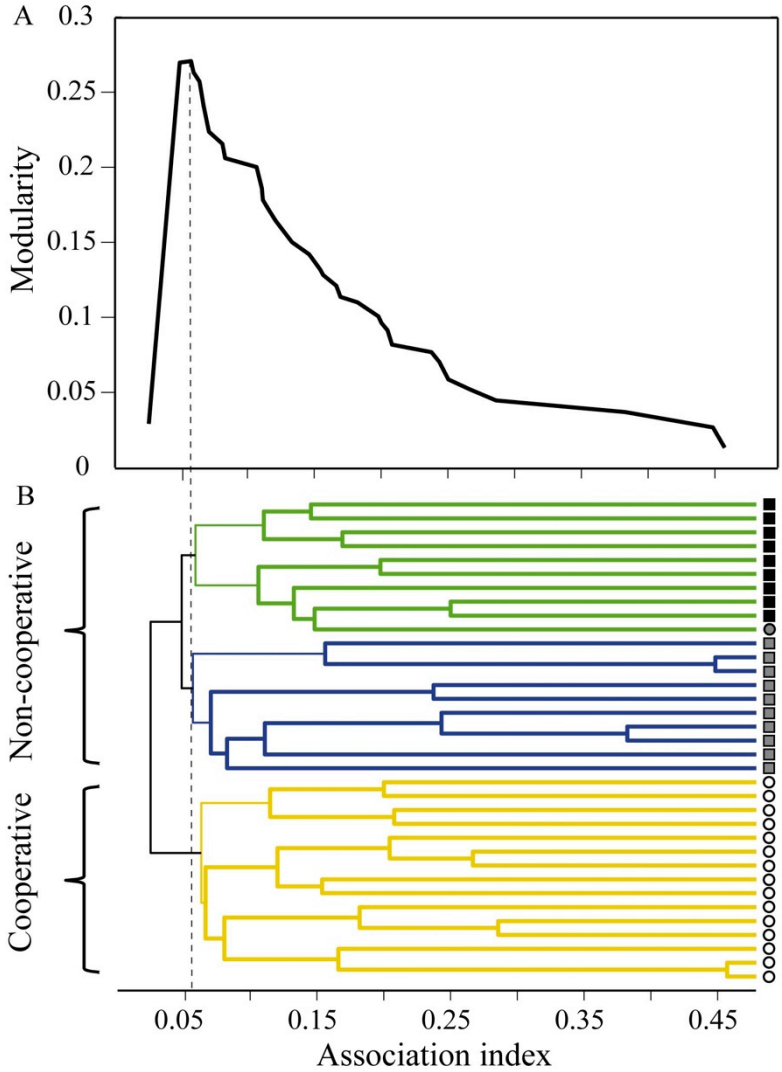

Figure S3: (A) The modularity distribution for the dolphin social network. (B) Hierarchical cluster analysis using the average linkage method (Cophenetic correlation coefficient = 0.790), in which the observed Q_{max} was used to define a significant partition (ANOSIM: R = 0.589, $p < 0.001$, 1000 permutations). Circles represent cooperative dolphins (the entire yellow branch, mean HWI = 0.089 ± 0.071, plus one in the green branch) and squares represent non cooperative dolphins (blue branch, mean HWI = 0.105 ± 0.058; and green branch, mean HWI = 0.088 ±

0.083). White symbols represent Module 1 in the original social network, while grey symbols represent Module 2 and black symbols Module 3 (see Fig. 1 in main text). The dotted grey line between figure A and B shows the maximized modularity value (Q_{max} = 0.272) that yielded a feasible partition in the dendrogram (at HWI = 0.059).

ESM4: Additional modularity analyses considering only data from mullet seasons or only data from outside mullet seasons.

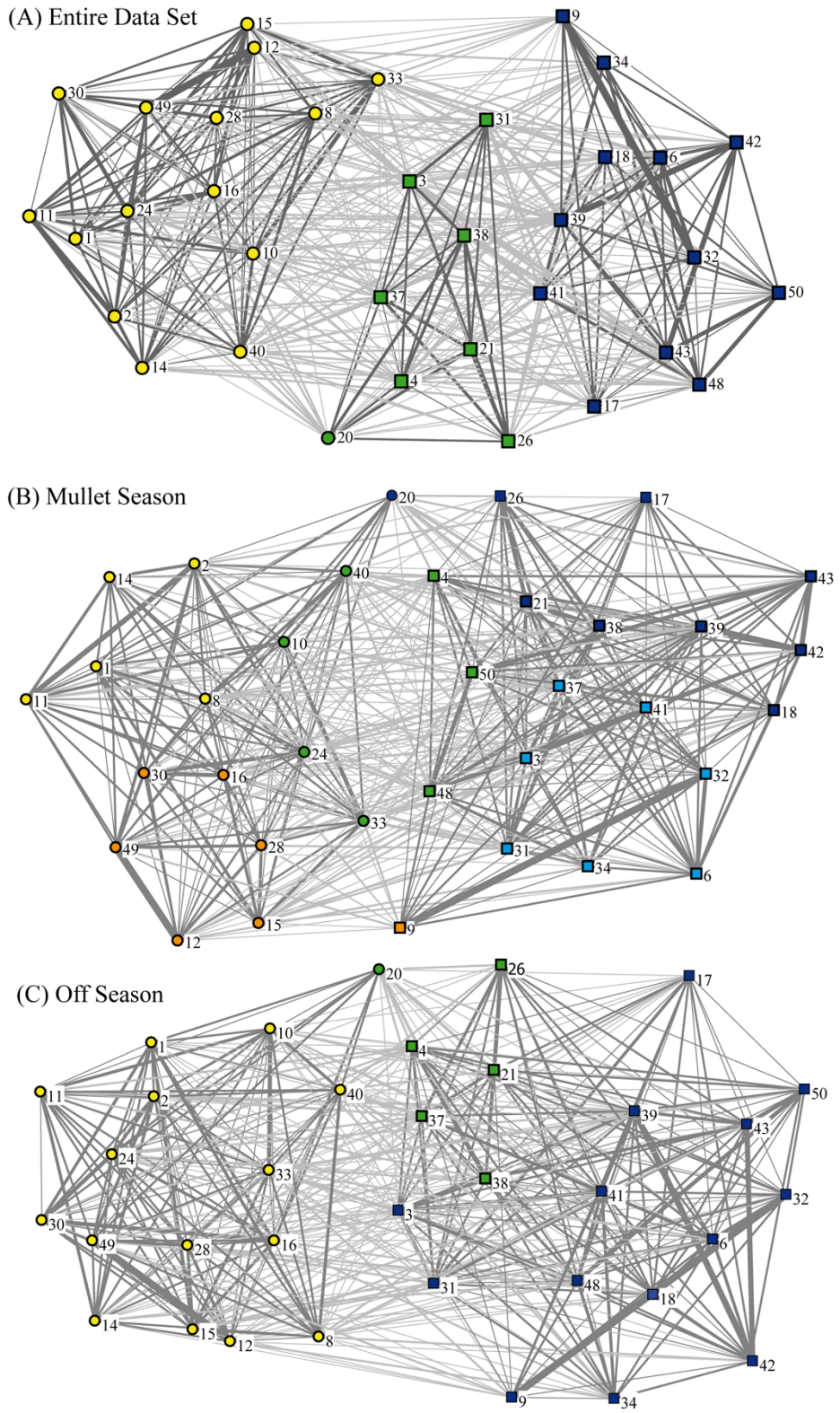

Figure S4: Social networks of dolphins from Laguna considering: our entire data set (A, the same as Fig. 1 in the main text), only data from the mullet season and (B), excluding data from mullet season (C). The link between the modular structure and the foraging classes (see main text) is consistent for all analytical scenarios. The off season network (C) showed the same modular structure observed for the entire data, adding two non-cooperative dolphins previously observed in the intermediary module to the non-cooperative module. Even though the mullet season network (B) showed five modules, the previous pattern was maintained. Two modules are almost exclusively formed by non-cooperative dolphins, while other two modules are almost exclusively formed by cooperative dolphins, suggesting a split in the previous modules (1 and 3, see Fig. 1 in the main text). In addition, this network also displayed an intermediary module formed by a mix of cooperative and non-cooperative dolphins. These results show that the seasonality of the main local food resource is not a major factor affecting the relation between the social structure and the foraging class. Curiously, this relation was slightly clearer when we excluded data from mullet season. During mullet seasons, the abundance of mullet in cooperative fishing spots may generate an aggregation process, mixing individuals with different foraging strategies. We highlight the position of individual '20', a potential social broker between both classes in all scenarios, which must be further investigated.

References

RS1. Seaman, D. E., Millspaugh, J. J., Kernohan, B. J., Brundige, G. C., Raedeke, K. J. & Gitzen, R. A. 1999 Effects of sample size on kernel home range estimates. *J Wildlife Manage.* **63**, 739–747

RS2. Silva, M. A., Magalhães, S., Prieto, R., Santos, R. S. & Hammond, P. S., 2008. Ranging patterns of bottlenose dolphin living in oceanic waters: implications for population structure. *Mar Biol*. **156**, 179–192.