Supplementary materials:

Diverse Community Structures in the Neuronal-level Connectome of the Drosophila Brain

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TABLE S1. Functional modules in the mesoscopic LPU-to-LPU network. The mesoscopic network of the *Drosophila* brain contains five functional modules. Olfactory and auditory modules can be further divided into submodules. The LPUs marked in red form the "rich club" structure, which is identified as the motor centre [28].

Module	Submodule	LPUs
Olfactory	Left Sensory	Al, dlp, lh, pan, spp
	Right Sensory	AL, DLP, LH, PAN, SPP
	Core	MB, mb, SDFP, sdfp
	SOG	SOG, sog
Auditory	Sensory	AMMC, ammc, CMP, cmp, CVLP, cvlp
	Core	CCP, ccp, DMP, dmp, VMP, vmp
Pre-Motor		EB, FB, IDFP, idfp, NOD, nod, PB
Left Vision		lob, lop, med, og, vlp-d, vlp-v
Right Vision		LOB, LOP, MED, OG, VLP-D, VLP-V

Supplementary figure legends

Figure S1. Neurons with topcentralities. (a1–a10) Top 10 neurons with largest degree. (b1–b10) Top 10 neurons with strongest strength. (c1–c10) Top 10 neurons with largest betweenness.

Figure S2. Neurons with top centralities (continued). (a1–a10) Top 10 neurons with highest dynamic importance. (b1–b10) Top 10 neurons with highest vulnerability. (c1–c10) Top 10 neurons with largest closeness. (d1–d10) Top 10 neurons with highest PageRank.

Figure S3. Neurons with top global centralities. Top 10 neurons with highest global centrality.

Figure S4. Statistics of the centralities for the eight communities. Box plots for the distribution of (a) closeness, (b) PageRank, (c) dynamic importance, and (d) vulnerability centralities for neurons in the eight communities.

Figure S5. Within-community degree and strength distribution. Degree (semi-log) and strength (log-log) distributions of the sub-networks of the eight communities by removing the inter-community connections.

Figure S6. Rich club neurons. (a) A schematic of the rich club in a network. The high-degree and mutually connected red nodes form the rich club of the network. (b)-(f) The neurons of the innermost rich club. (g)-(l) The six neurons in the RC with smallest *p*-value. All members in RC are pre-motor neurons.

Figure S7. Examples of irreducible loops with length = 5. (a) The strongest 5-loop (S_L = 200) in the network. All five neurons are interneurons in the right antennal lobe. (b) Another strongest 5-loop (S_L = 200) connecting the bilateral antennal lobes. (c) The strongest loops (S_L = 129) which is not localised in the antennal lobes. (d) A strong (S_L = 59) which connects the olfactory core and pre-motor communities.

Figure S8. Distribution of the intra-community loops. Each panel displays the distribution of intra-community loops (strength > 50) across all communities for the specified loop length (*l*). While the olfactory communities account for the majority of the short loops (*l*=3), the long loops (*l*=4-6) are mainly located in the motor community

Figure S9. Distribution of the inter-community loops. Each panel displays the distribution of intra-community loops (strength > 50) across all communities for the specified loop length (*l*). Each of the loops connect at least two communities.

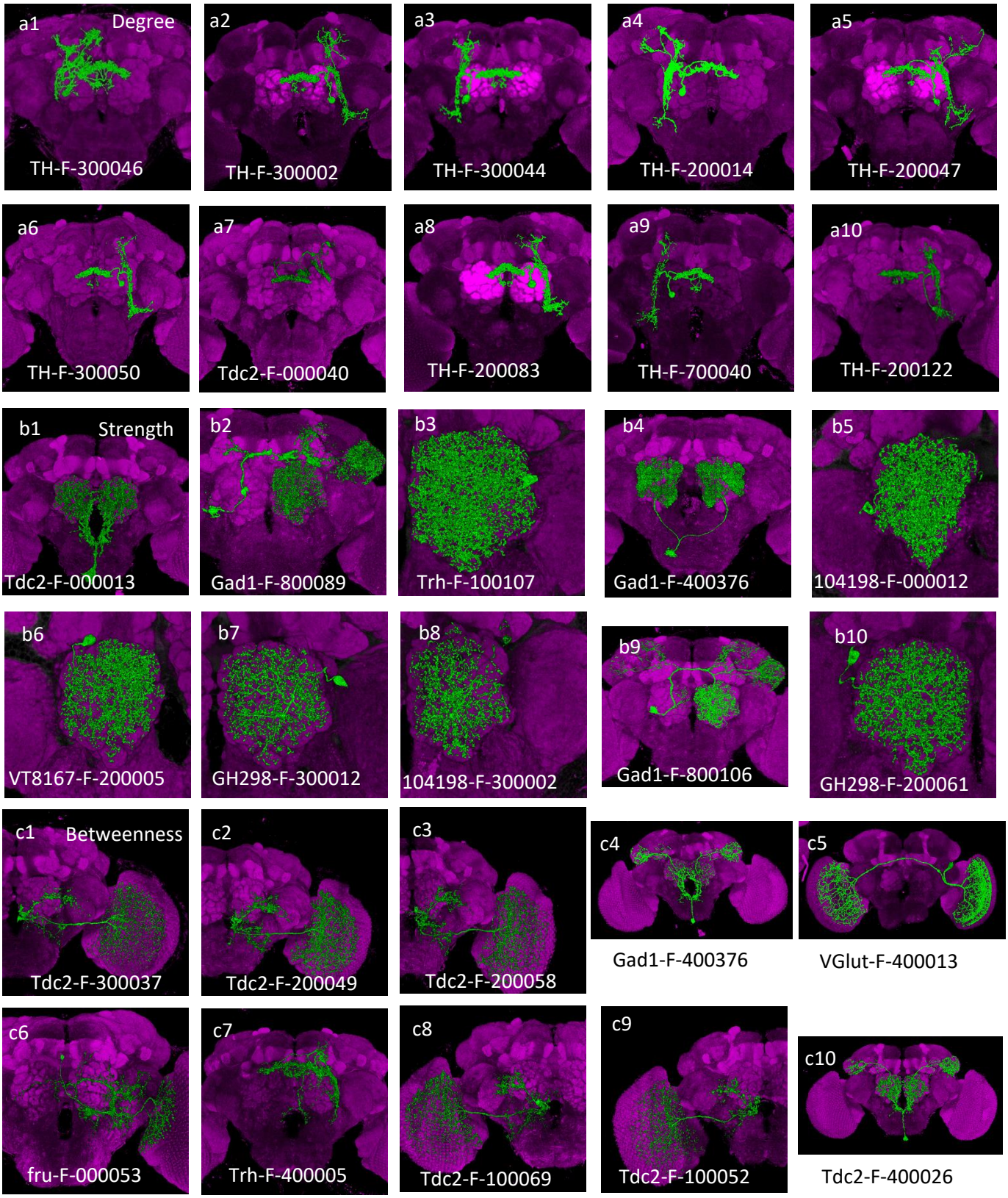

Figure S1. Neurons with top centralities.

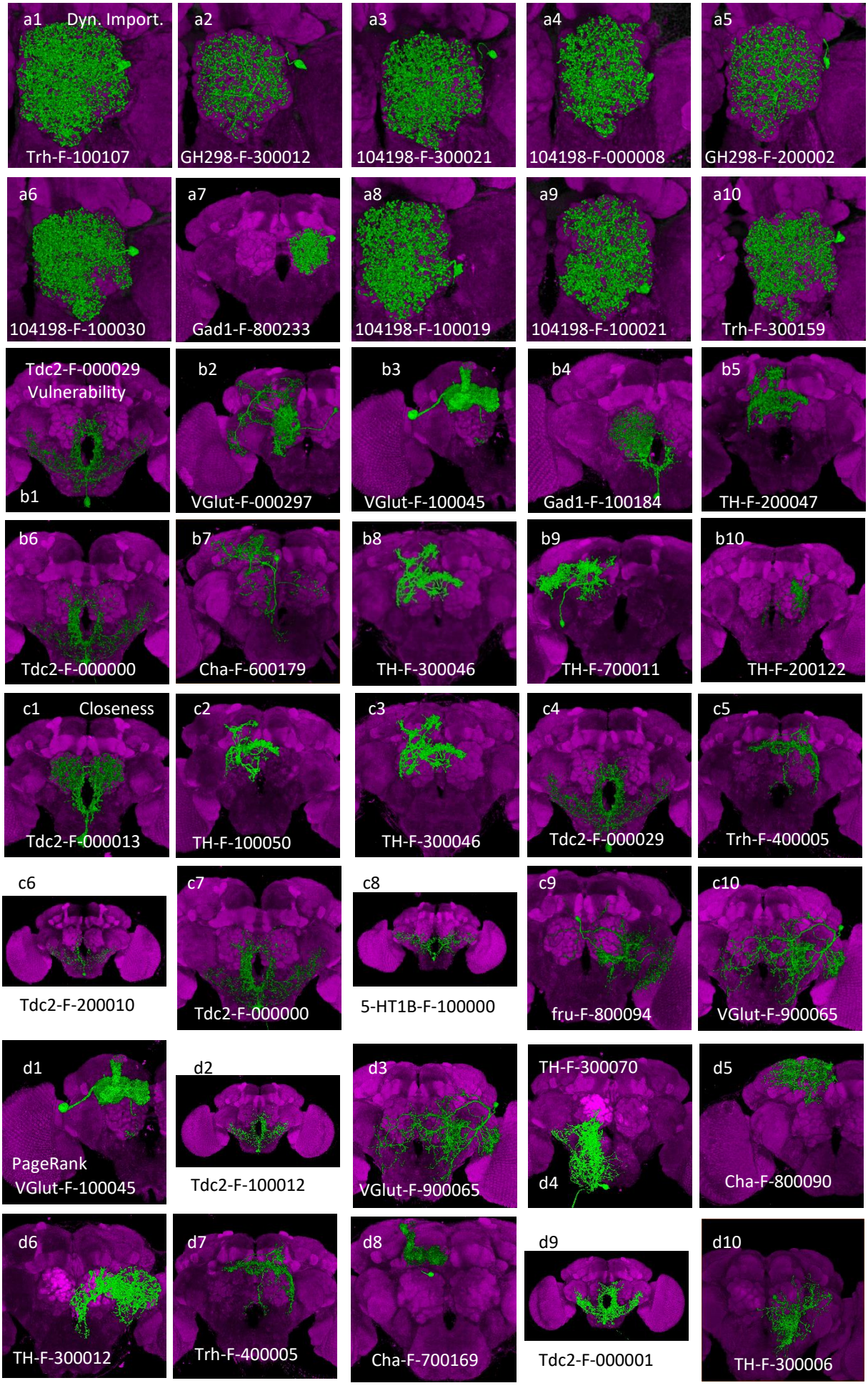

Figure S2. Neurons with top centralities (continued).

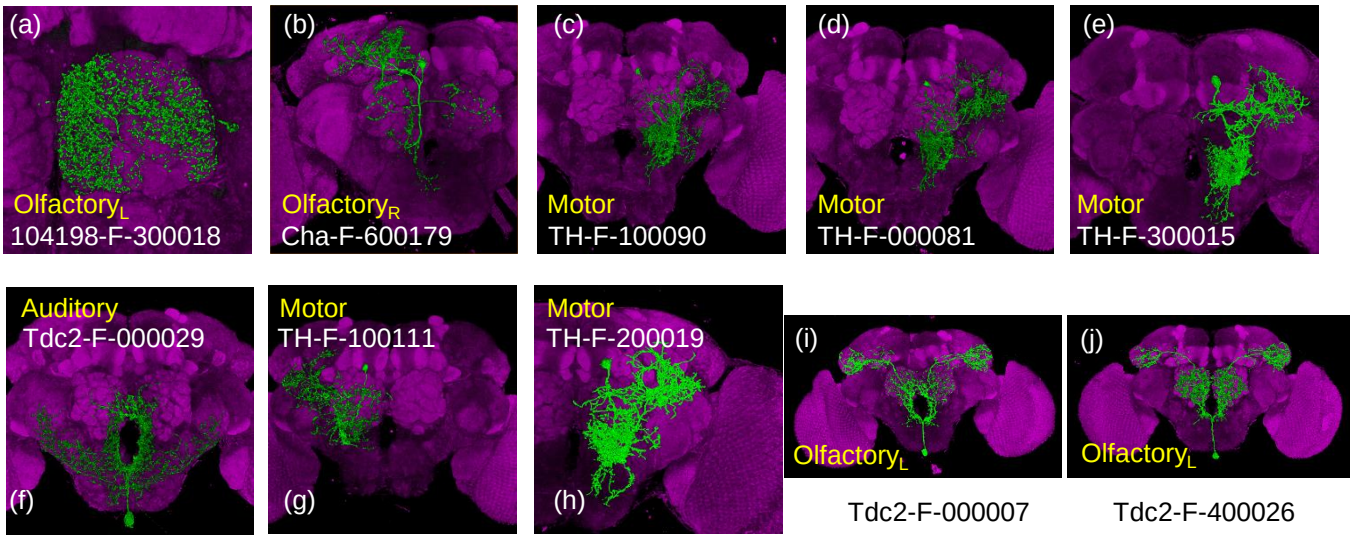

Figure S3. Neurons with top global centralities.

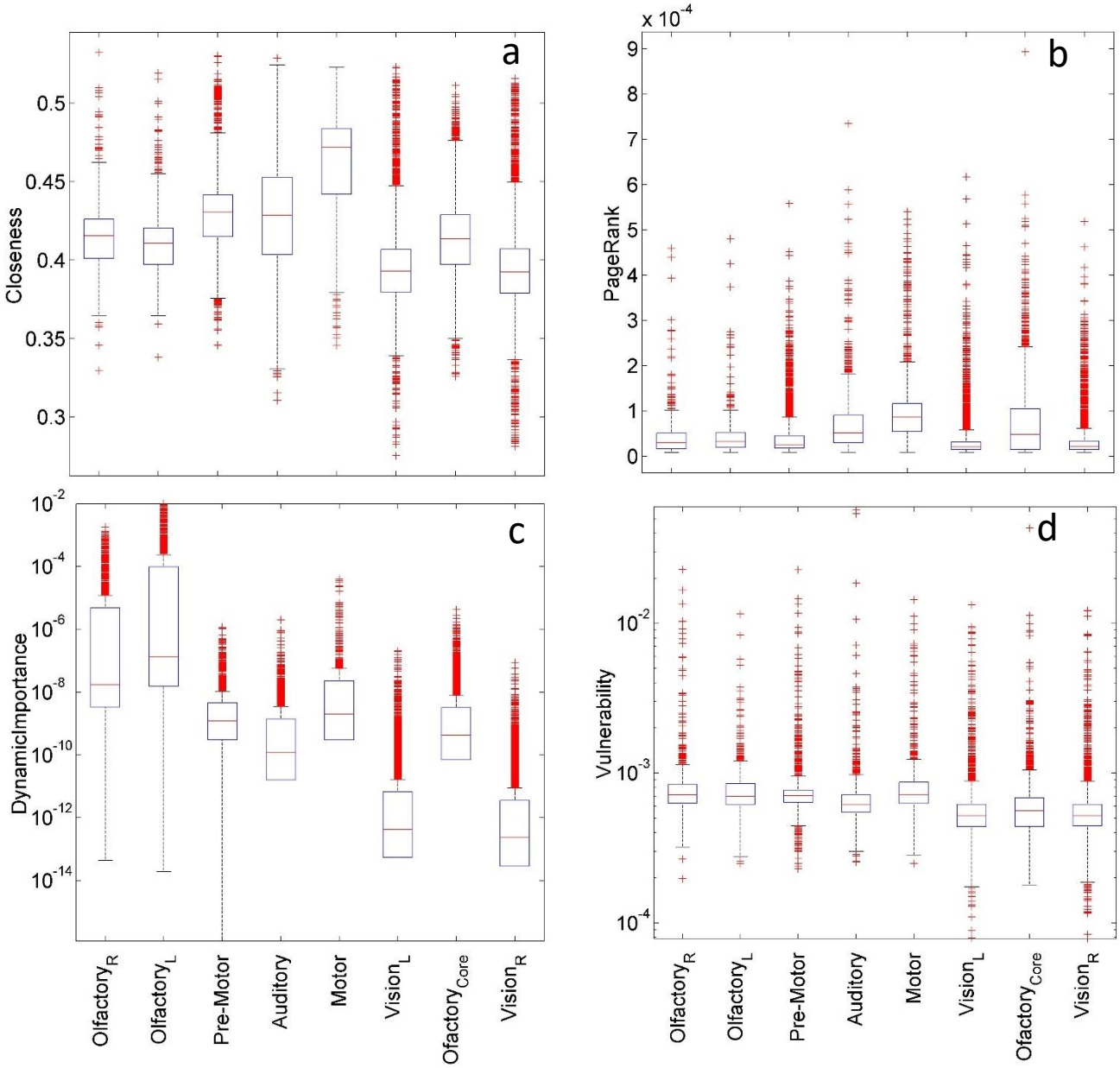

Figure S4. Statistics of the centralities for the eight communities.

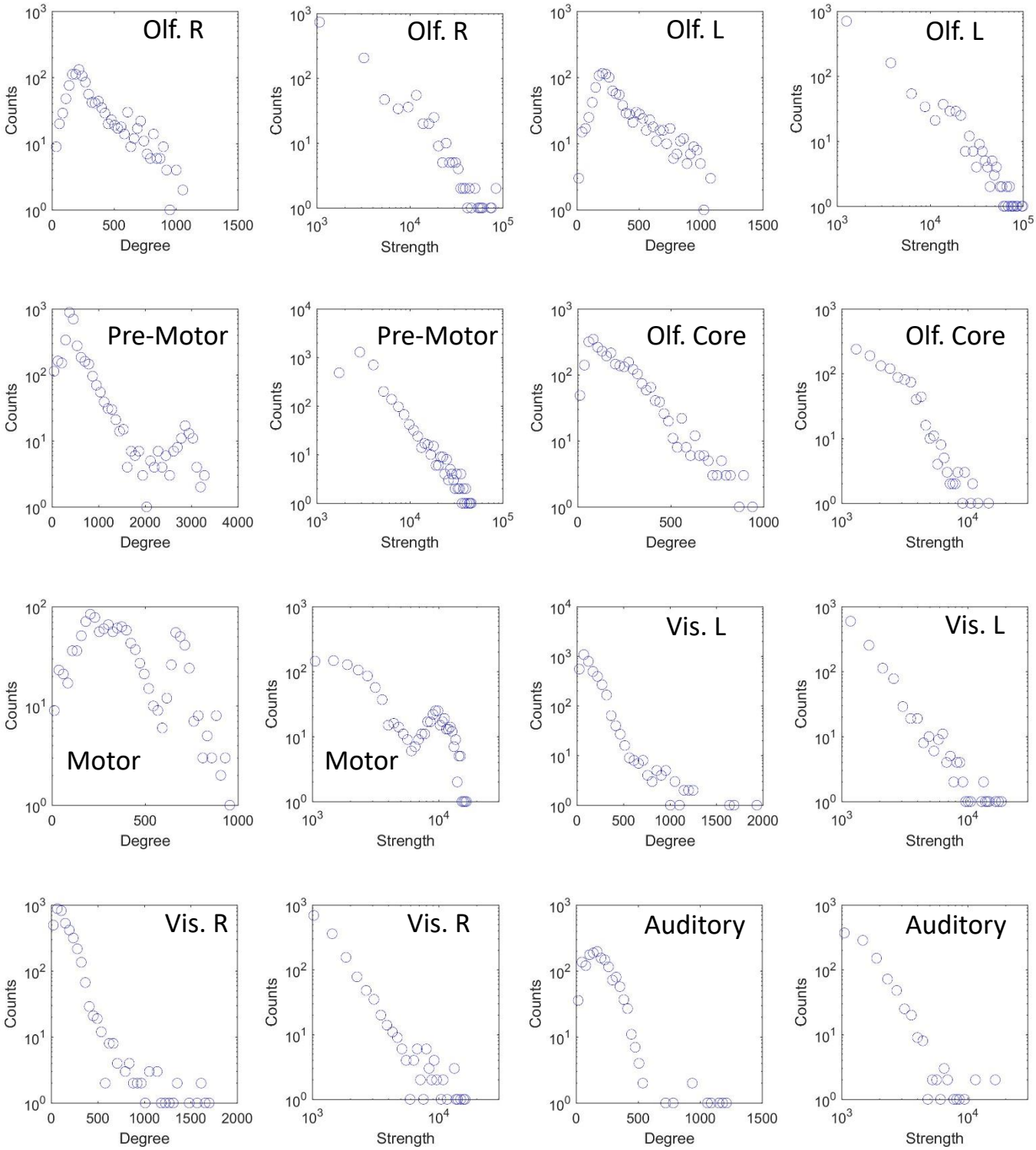

Figure S5. Within-community degree and strength distribution.

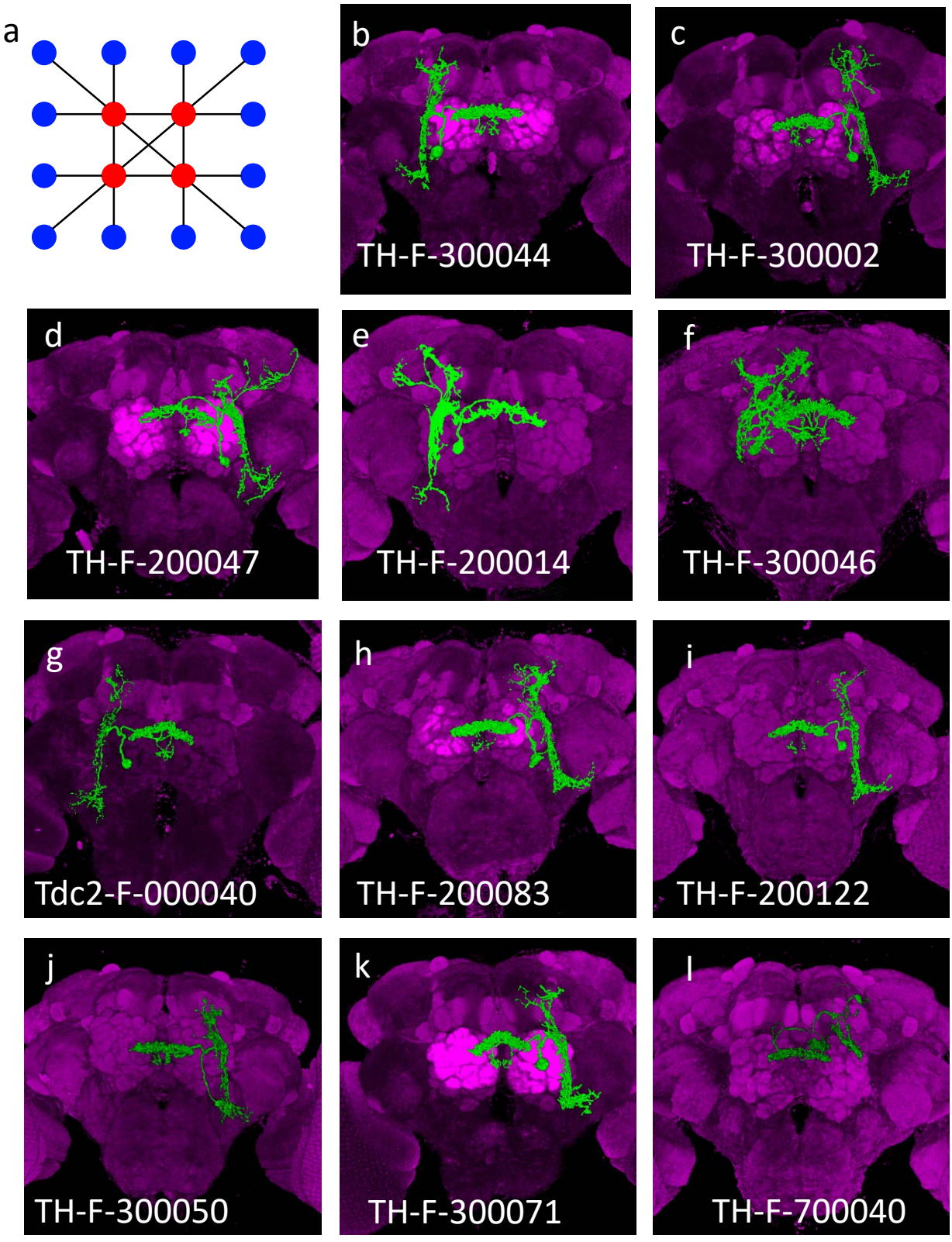

Figure S6. Rich club neurons.

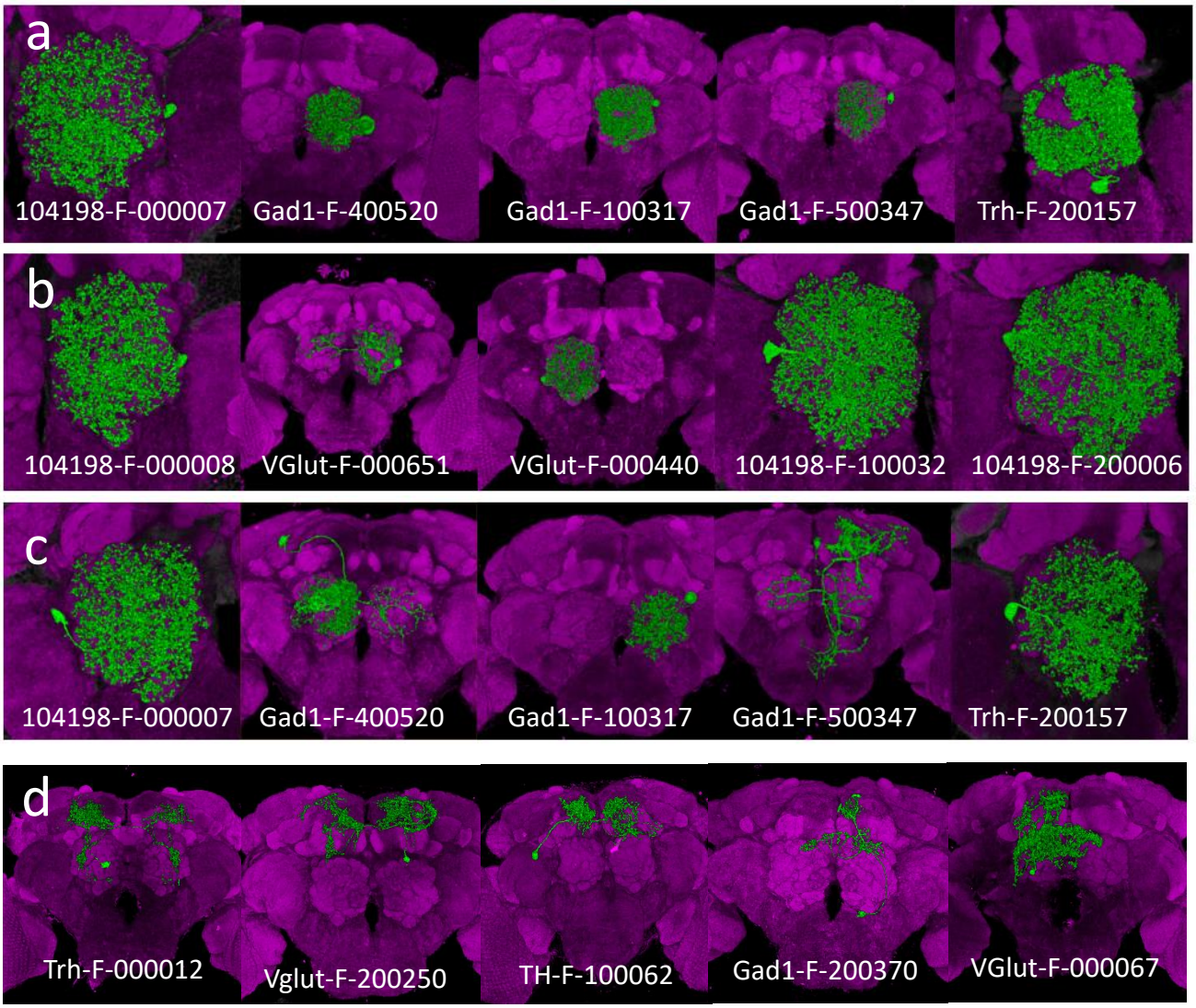

Figure S7. Examples of irreducible loops with length = 5.

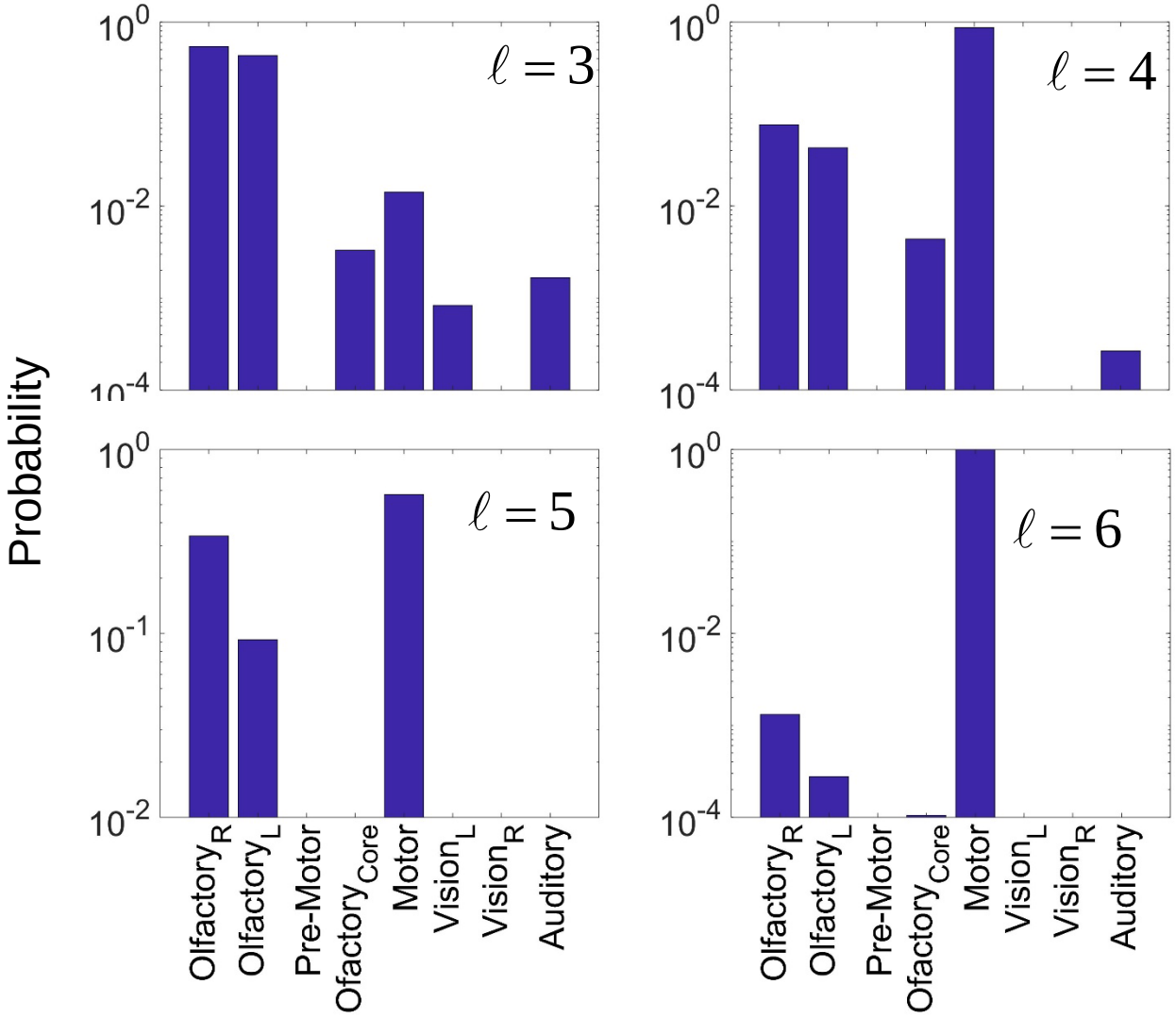

Figure S8. Distribution of the intra-community loops.

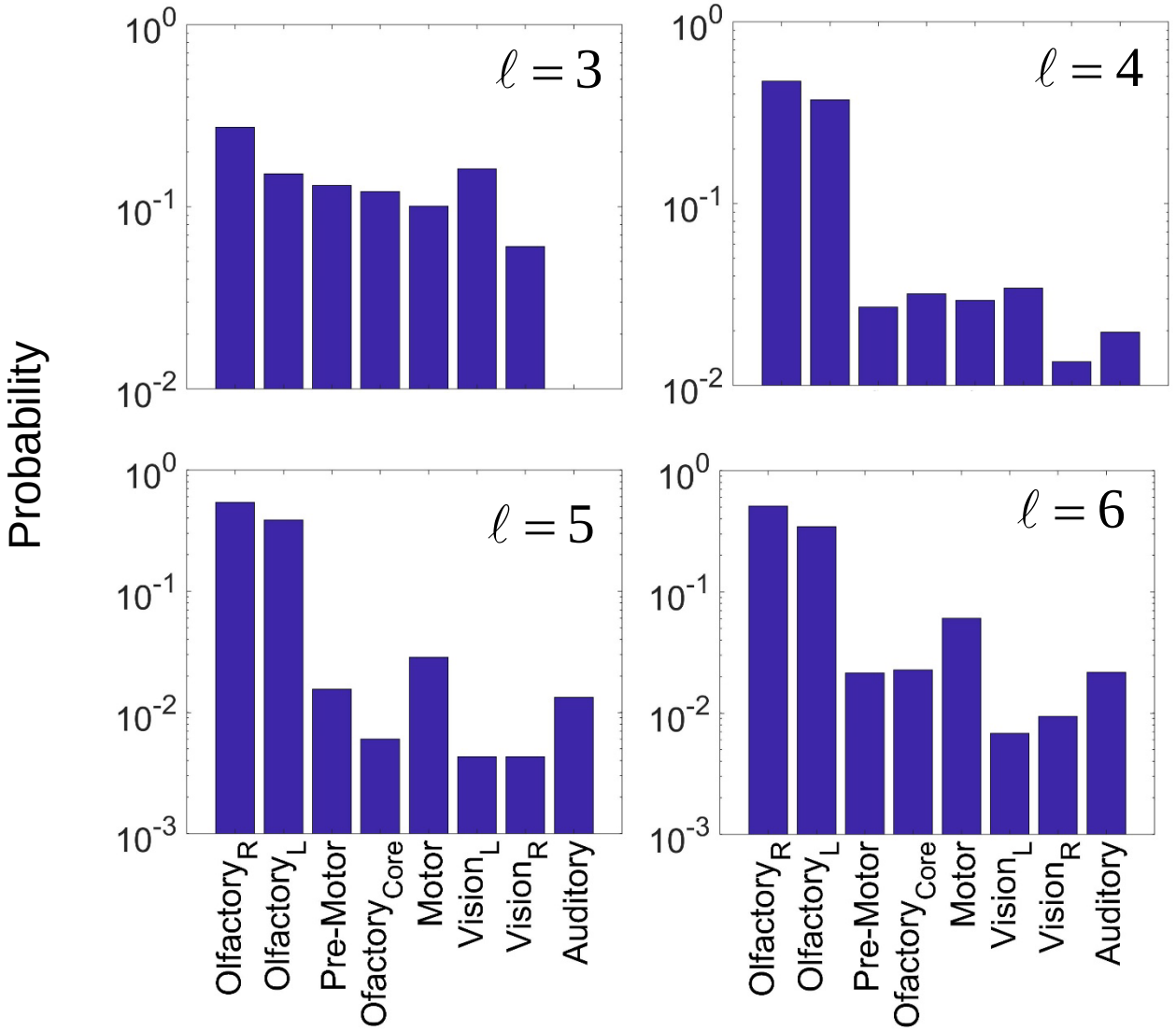

Figure S9. Distribution of the inter-community loops.