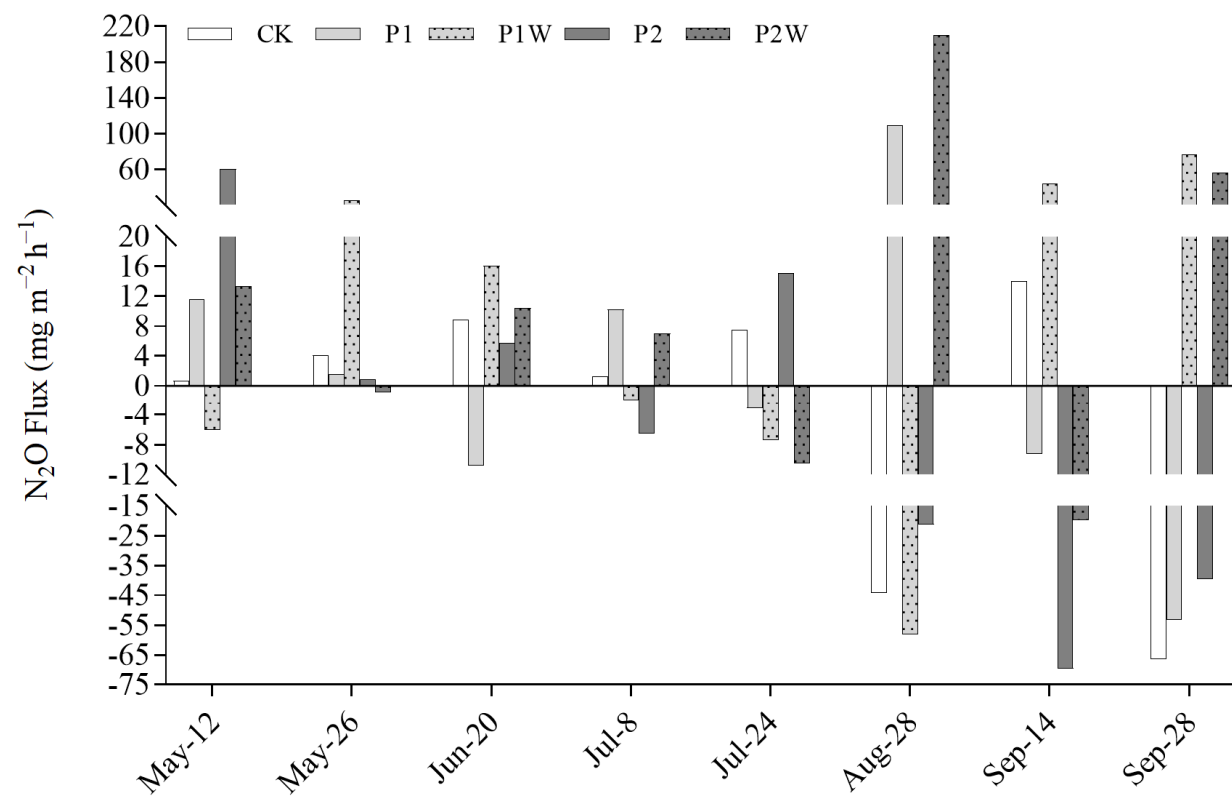
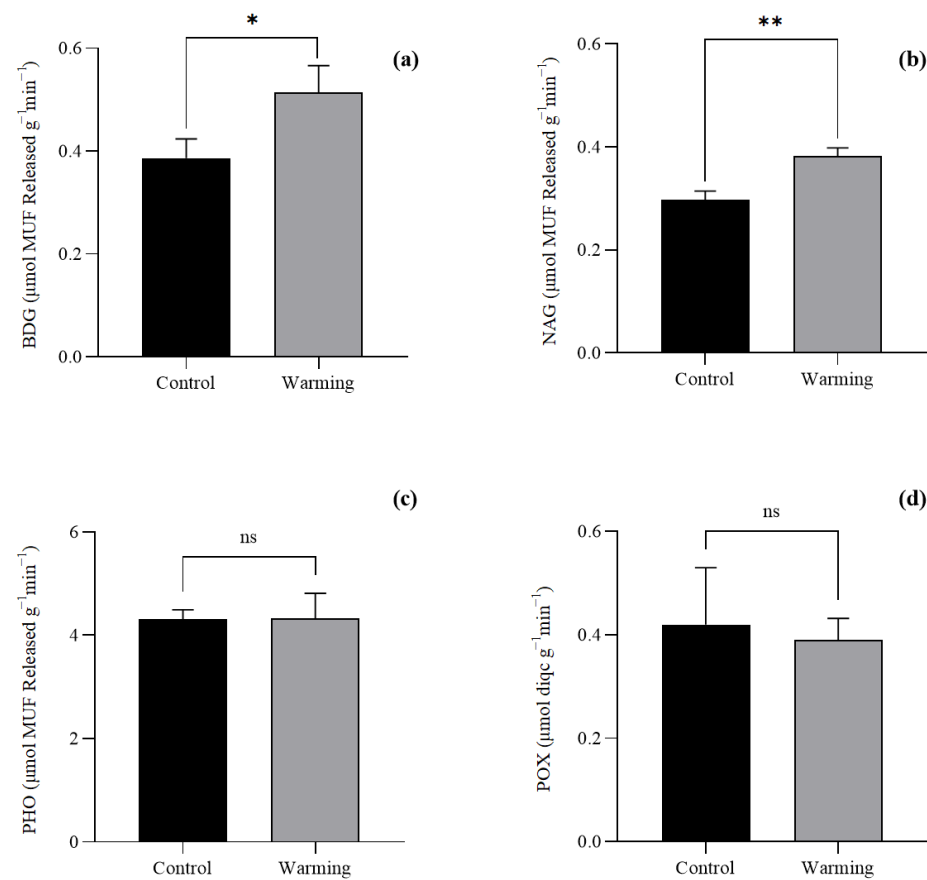


**Figure S1.** Warming effect of open top chambers (OTC) in Hani peatland in the growing season of 2019.



**Figure S2.** Monthly mean N<sub>2</sub>O fluxes (mean  $\pm$  SE,  $n = 4$ ) in Hani peatland in the growing season of 2019. CK, control; P1, P addition with 5 kg P ha<sup>-1</sup> yr<sup>-1</sup>; P2, P addition with 10 kg P ha<sup>-1</sup> yr<sup>-1</sup>; P1W, P1 + warming; P2W, P2 + warming.



**Figure S3.** Soil enzyme activities under warming (mean  $\pm$  SE,  $n = 4$ ). (a) BDG; (b) NAG; (c) PHO; (d) POX. BDG,  $\beta$ -D-glucosidase; NAG, N-acetyl- $\beta$ -glucosaminidase; PHO, phosphatase; POX, phenol oxidase. Asterisk represents a significant difference, \*\*  $p < 0.01$ ; \*  $p < 0.05$ ; ns, no significant difference.

**Table S1.** Correlation analysis between biological and abiotic factors under P addition and co-effect of P addition and warming in Hani peatland.

|      | Flux    | DOC       | TP        | TN        | TC      | SC        | VPC       | TCov    | WTD       | C:N       | N:P       | pH     | BDG       | NAG      | POX      | PHO |
|------|---------|-----------|-----------|-----------|---------|-----------|-----------|---------|-----------|-----------|-----------|--------|-----------|----------|----------|-----|
| Flux |         |           |           |           |         |           |           |         |           |           |           |        |           |          |          |     |
| DOC  | 0.091   |           |           |           |         |           |           |         |           |           |           |        |           |          |          |     |
| TP   | 0.362   | 0.562     |           |           |         |           |           |         |           |           |           |        |           |          |          |     |
| TN   | 0.201   | 0.246     | 0.768 **  |           |         |           |           |         |           |           |           |        |           |          |          |     |
| TC   | -0.045  | -0.254    | 0.146     | 0.269     |         |           |           |         |           |           |           |        |           |          |          |     |
| SC   | -0.278  | -0.209    | -0.348    | -0.056    | 0.332   |           |           |         |           |           |           |        |           |          |          |     |
| VPC  | 0.355   | 0.452 *   | 0.544 *   | 0.285     | -0.295  | -0.606 ** |           |         |           |           |           |        |           |          |          |     |
| TCov | -0.135  | -0.004    | -0.475 *  | -0.346    | -0.099  | 0.674 **  | -0.402    |         |           |           |           |        |           |          |          |     |
| WTD  | -0.242  | -0.575 ** | -0.235    | 0.088     | 0.476 * | 0.135     | -0.467 *  | -0.165  |           |           |           |        |           |          |          |     |
| C:N  | -0.195  | -0.318    | -0.766 ** | -0.975 ** | -0.061  | 0.112     | -0.357    | 0.327   | 0.008     |           |           |        |           |          |          |     |
| N:P  | -0.36   | -0.639 ** | -0.927 ** | -0.529 *  | 0.027   | 0.525 *   | -0.725 ** | 0.489 * | 0.410     | 0.556 *   |           |        |           |          |          |     |
| pH   | -0.047  | -0.488 *  | -0.37     | 0.077     | 0.078   | 0.142     | -0.072    | -0.2    | 0.299     | -0.082    | 0.435     |        |           |          |          |     |
| BDG  | 0.432   | 0.411     | 0.683 **  | 0.549 *   | -0.297  | -0.529 *  | 0.668 **  | -0.348  | -0.317    | -0.617 ** | -0.701 ** | -0.229 |           |          |          |     |
| NAG  | 0.515 * | 0.394     | 0.693 **  | 0.639 **  | 0.093   | -0.185    | 0.416     | -0.188  | -0.142    | -0.641 ** | -0.618 ** | 0.027  | 0.705 **  |          |          |     |
| POX  | 0.346   | 0.728 **  | 0.722 **  | 0.422     | -0.264  | -0.456 *  | 0.638 **  | -0.25   | -0.589 ** | -0.495 *  | -0.778 ** | -0.244 | 0.621 **  | 0.491 *  |          |     |
| PHO  | -0.227  | -0.504 *  | -0.476 *  | -0.374    | 0.186   | 0.643 **  | -0.657 ** | 0.459 * | 0.208     | 0.431     | 0.586 **  | -0.002 | -0.624 ** | -0.551 * | -0.509 * |     |

Note: WTD, water table depth; DOC, dissolved organic carbon; TN, total nitrogen; TC, total carbon; TP, total phosphorus; SC, *Sphagnum* cover; VPC, vascular plants cover; TCov, total cover; BDG,  $\beta$ -D-glucosidase; NAG, N-acetyl- $\beta$ -glucosaminidase; POX, phenol oxidase; PHO, phosphatase. \*\*  $p < 0.01$ , \*  $p < 0.05$ .