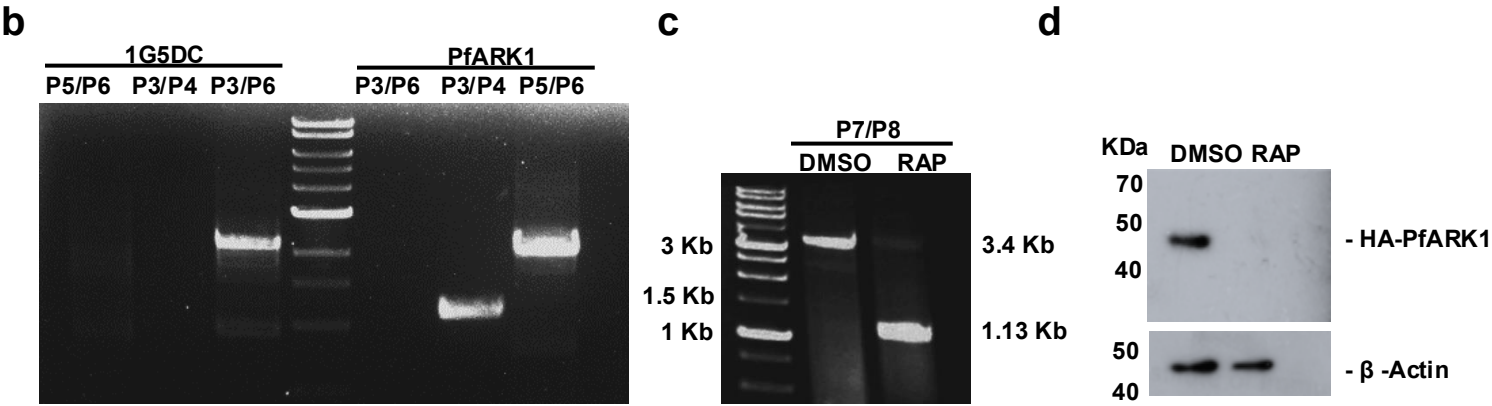
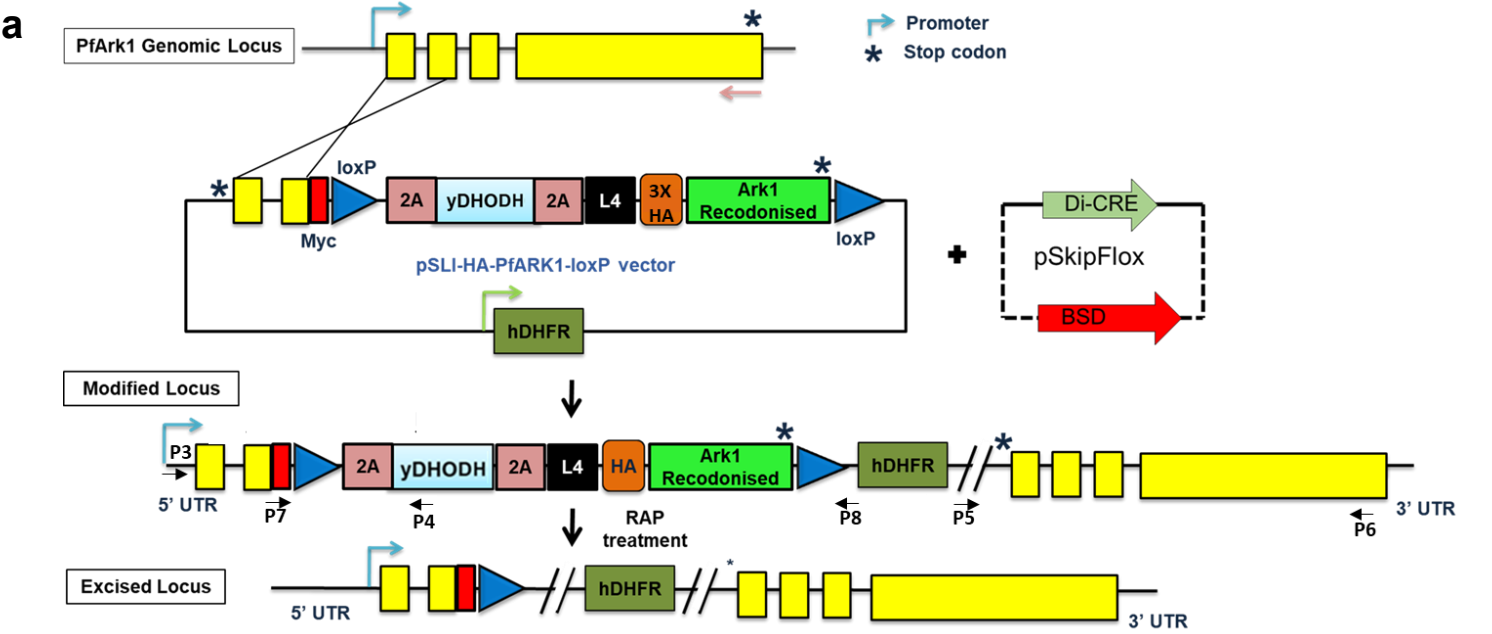
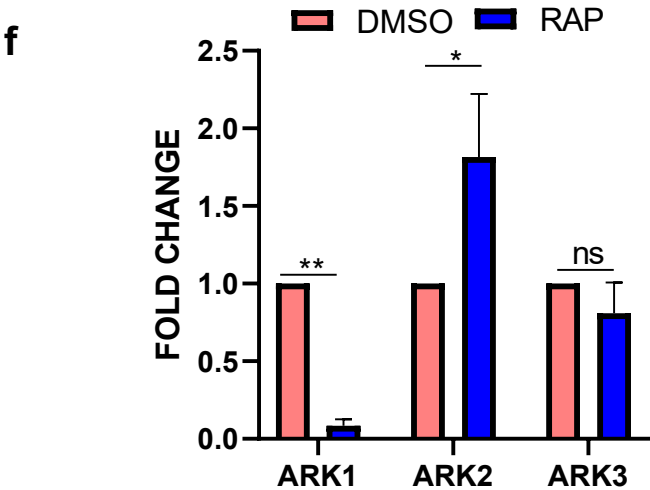
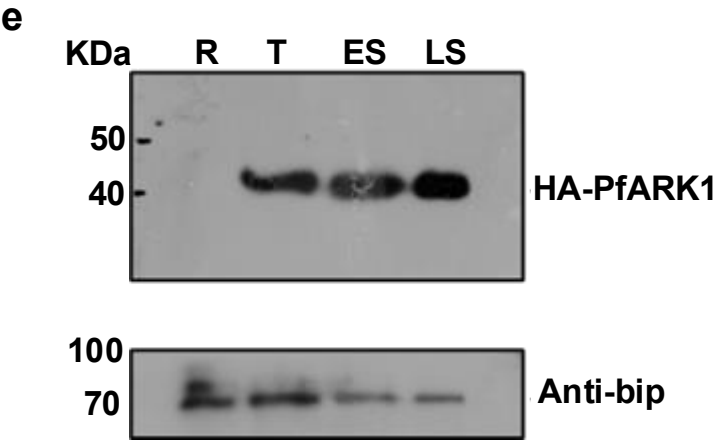


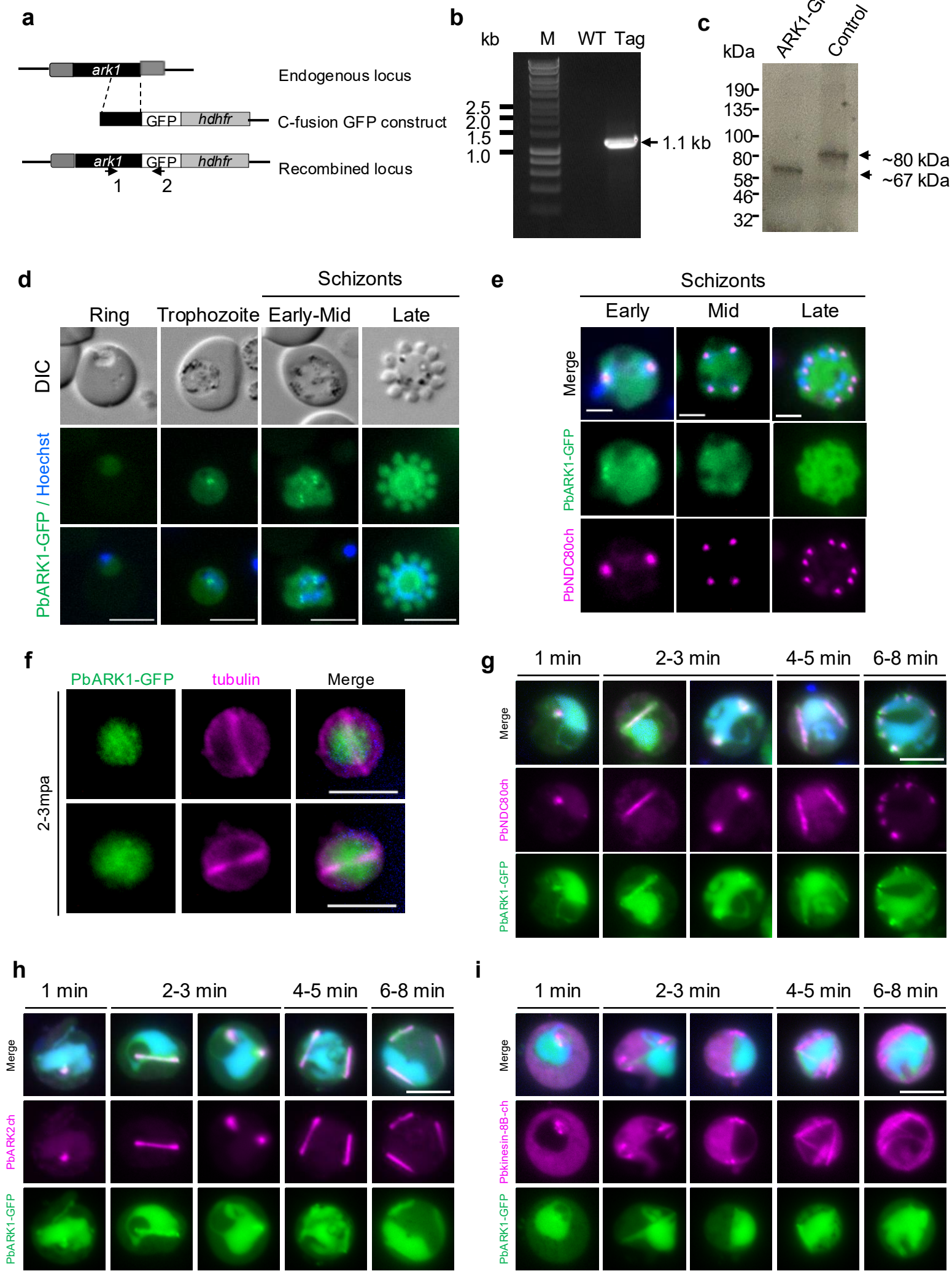
Extended Data Fig. 1



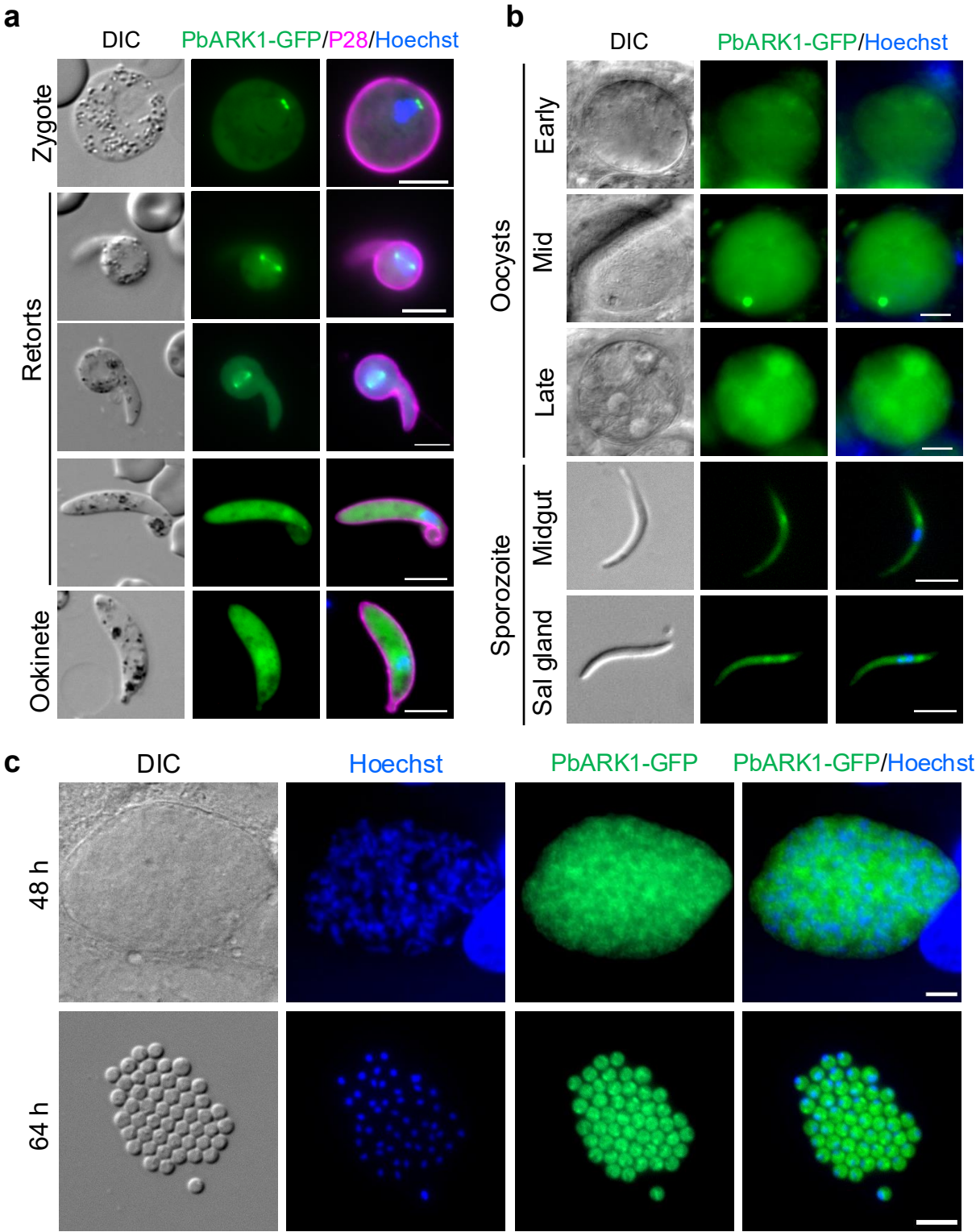
| Locus          | Primer set | Expected size |
|----------------|------------|---------------|
| WT             | P3/P6      | 2.2 Kb        |
| 5' Integration | P3/P4      | 1.11 Kb       |
| 3' Integration | P5/P6      | 1.9 Kb        |



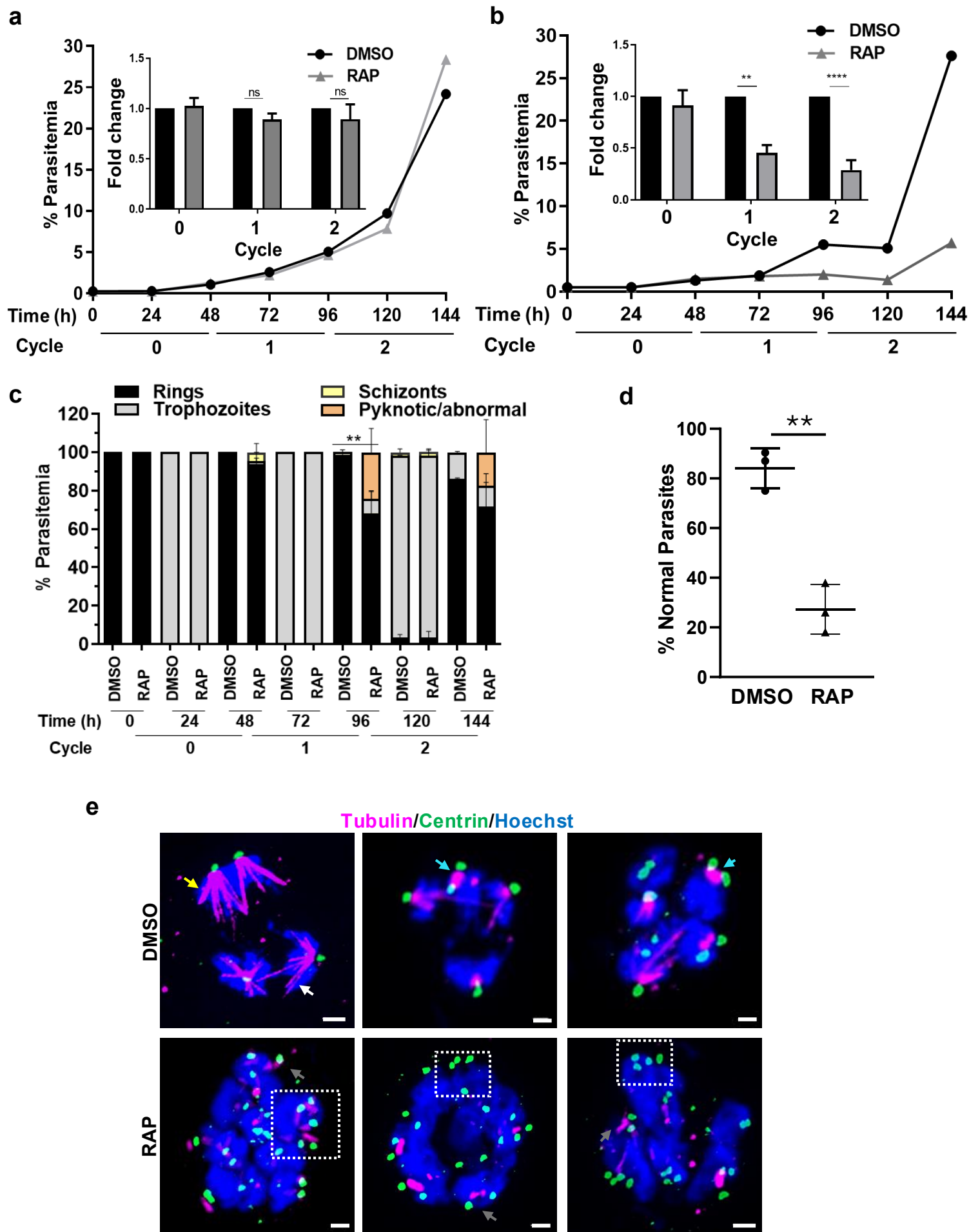
**Extended Data Fig. 2**



Extended Data Fig. 3



Extended Data Fig. 4



**P-value**

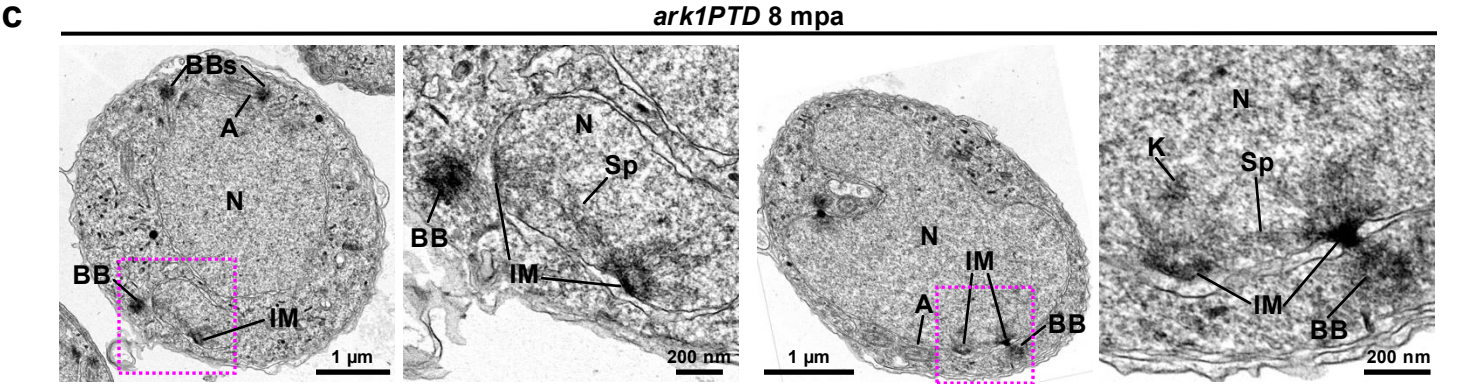
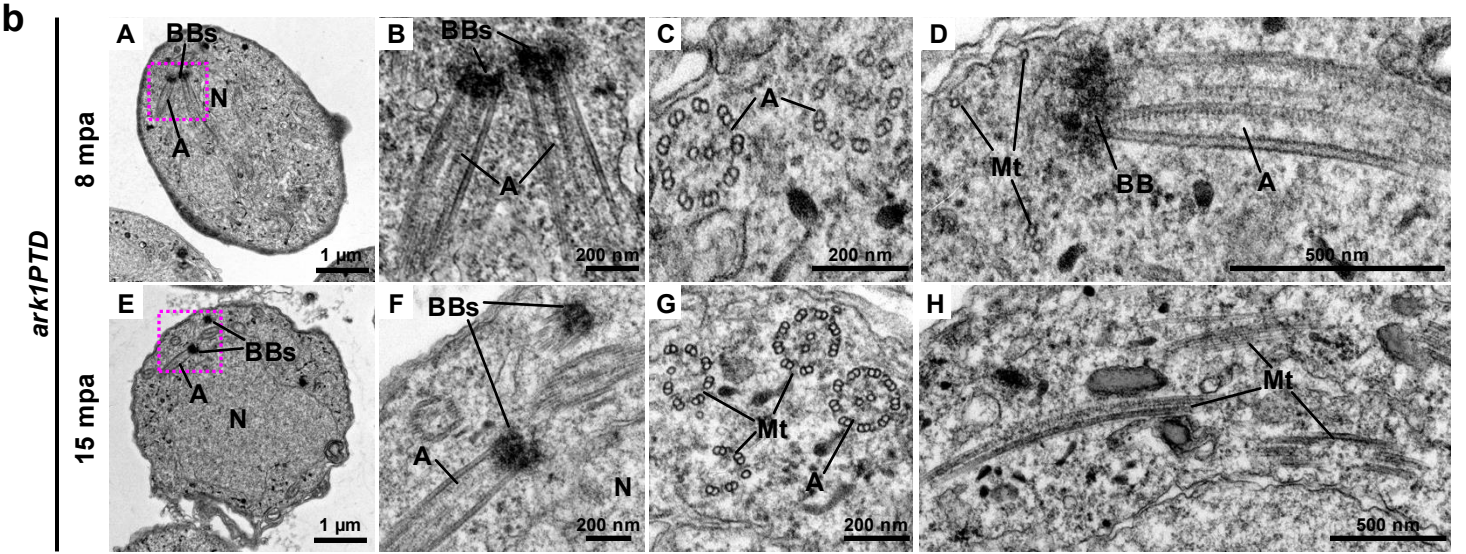
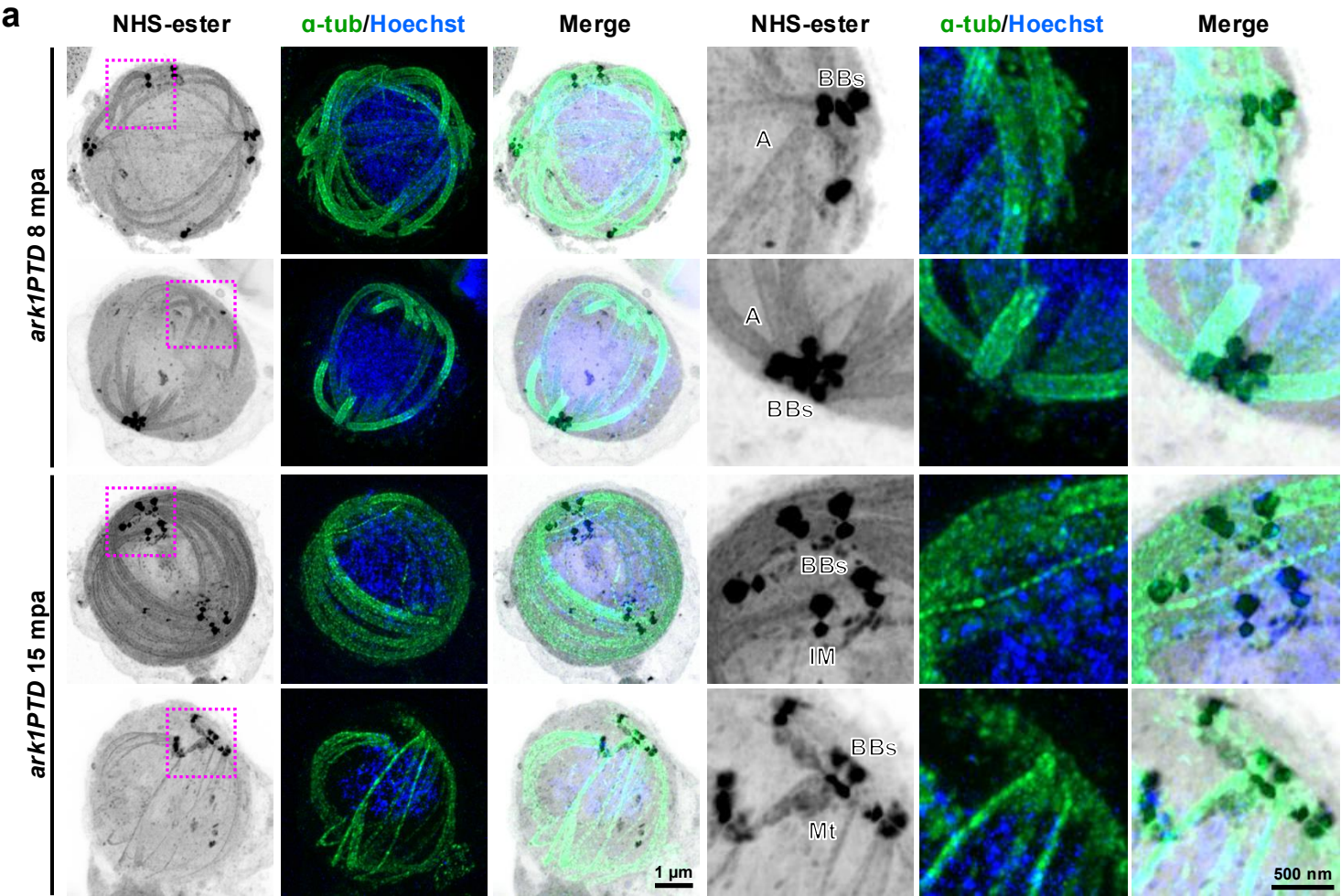


$10^{-20}$

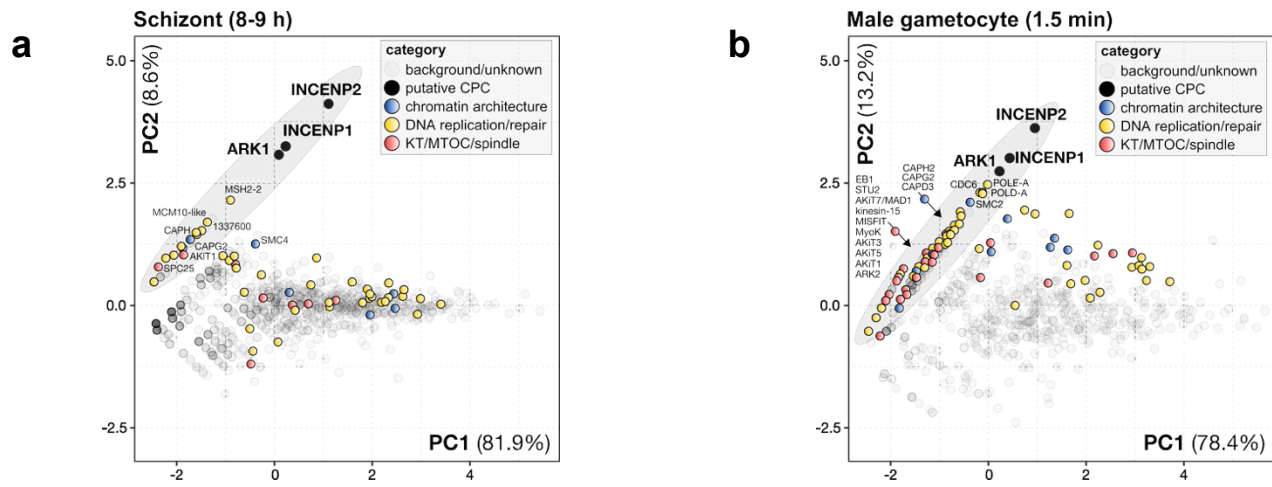
$10^{-10}$

1

Extended Data Fig. 6



# Extended Data Fig. 7



| Protein IDs    | Description                                   | gene_name     | category                 | AA   | Schizonts |     |        |        | Male gametocytes |     |        |        |
|----------------|-----------------------------------------------|---------------|--------------------------|------|-----------|-----|--------|--------|------------------|-----|--------|--------|
|                |                                               |               |                          |      | WT1       | WT2 | ARK1-1 | ARK1-2 | WT1              | WT2 | ARK1-1 | ARK1-2 |
| PBANKA_1343200 | inner centromere protein                      | INCENP2       | CPC                      | 2305 | 0         | 0   | 60     | 44     | 0                | 0   | 76     | 41     |
| PBANKA_1353900 | inner centromere protein                      | INCENP1       | CPC                      | 1126 | 0         | 0   | 21     | 21     | 0                | 0   | 42     | 28     |
| PBANKA_0104100 | aurora-related kinase ARK1                    | ARK1          | CPC                      | 353  | 0         | 0   | 13     | 15     | 0                | 0   | 24     | 13     |
| PBANKA_1011400 | DNA topoisomerase 2                           | TOP2          | chromatin architecture   | 1472 | 12        | 14  | 15     | 14     | 4                | 4   | 29     | 14     |
| PBANKA_1312000 | condensin-2 complex subunit G2                | CAPG2         | chromatin architecture   | 1181 | 0         | 1   | 2      | 2      | 0                | 0   | 10     | 2      |
| PBANKA_0913000 | condensin-2 complex subunit D3                | CAPD3         | chromatin architecture   | 1706 | 0         | 0   | 0      | 0      | 0                | 0   | 8      | 3      |
| PBANKA_0301800 | condensin-2 complex subunit H2                | CAPH2         | chromatin architecture   | 775  | 0         | 0   | 0      | 0      | 0                | 0   | 6      | 2      |
| PBANKA_1337500 | protein STU2                                  | STU2          | kinetochore              | 3198 | 3         | 1   | 5      | 2      | 0                | 0   | 14     | 6      |
| PBANKA_0612300 | apicomplexan kinetochore protein 7            | AKIT7/MAD1    | kinetochore              | 832  | 2         | 1   | 0      | 2      | 0                | 0   | 10     | 2      |
| PBANKA_0612200 | apicomplexan kinetochore protein 3            | AKIT3         | kinetochore              | 1251 | 0         | 0   | 0      | 0      | 0                | 0   | 8      | 0      |
| PBANKA_1243900 | apicomplexan kinetochore protein 5            | AKIT5         | kinetochore              | 1522 | 1         | 1   | 1      | 2      | 0                | 0   | 6      | 0      |
| PBANKA_0621300 | apicomplexan kinetochore protein 1            | AKIT1         | kinetochore              | 1737 | 1         | 1   | 2      | 2      | 0                | 0   | 4      | 3      |
| PBANKA_1358800 | kinetochore protein SPC25                     | SPC25         | kinetochore              | 216  | 0         | 0   | 2      | 0      | 0                | 0   | 3      | 0      |
| PBANKA_1115700 | kinetochore protein NDC80                     | NDC80         | kinetochore              | 589  | 0         | 0   | 0      | 0      | 0                | 0   | 3      | 0      |
| PBANKA_1442300 | kinetochore protein SPC24                     | SPC24         | kinetochore              | 819  | 0         | 0   | 0      | 0      | 0                | 0   | 3      | 0      |
| PBANKA_0522000 | apicomplexan kinetochore protein 6            | AKIT6         | kinetochore              | 465  | 0         | 0   | 0      | 0      | 0                | 0   | 2      | 0      |
| PBANKA_0414300 | kinetochore protein NUF2                      | NUF2          | kinetochore              | 457  | 0         | 0   | 0      | 0      | 0                | 0   | 0      | 2      |
| PBANKA_0908500 | myosin K                                      | MyoK          | spindle                  | 1629 | 0         | 0   | 0      | 0      | 0                | 0   | 12     | 0      |
| PBANKA_1038200 | nuclear formin-like protein MISFIT            | MISFIT        | spindle                  | 1594 | 0         | 0   | 0      | 0      | 0                | 0   | 7      | 2      |
| PBANKA_0405600 | end-binding protein 1                         | EB1           | spindle                  | 435  | 0         | 0   | 0      | 0      | 0                | 0   | 6      | 3      |
| PBANKA_1458800 | kinesin-15                                    | kinesin-15    | spindle                  | 1414 | 0         | 0   | 0      | 0      | 0                | 0   | 5      | 6      |
| PBANKA_0407400 | aurora-related kinase ARK2                    | ARK2          | spindle                  | 1719 | 0         | 0   | 0      | 0      | 0                | 0   | 4      | 0      |
| PBANKA_0805900 | kinesin-8X                                    | kinesin-8X    | spindle                  | 1409 | 0         | 0   | 0      | 0      | 0                | 0   | 4      | 0      |
| PBANKA_0416100 | dynein heavy chain                            | DHC3          | MTOC                     | 5834 | 4         | 7   | 1      | 3      | 7                | 12  | 46     | 40     |
| PBANKA_0925400 | dynein heavy chain                            | DHC4A         | MTOC                     | 5176 | 2         | 4   | 3      | 3      | 6                | 8   | 36     | 36     |
| PBANKA_0214000 | dynein heavy chain                            | DHC1          | MTOC                     | 5058 | 8         | 6   | 6      | 9      | 2                | 4   | 35     | 4      |
| PBANKA_0507300 | dynein heavy chain                            | DHC4B         | MTOC                     | 5309 | 0         | 4   | 1      | 0      | 4                | 6   | 29     | 31     |
| PBANKA_0801500 | conserved Plasmodium protein                  | CCDC63        | MTOC                     | 745  | 0         | 0   | 0      | 0      | 0                | 2   | 14     | 9      |
| PBANKA_0202700 | kinesin-8B                                    | kinesin-8B    | MTOC                     | 1460 | 0         | 0   | 0      | 0      | 2                | 10  | 13     | 10     |
| PBANKA_1361500 | WD repeat-containing protein 16               | CFAP52        | MTOC                     | 723  | 0         | 2   | 0      | 0      | 0                | 2   | 12     | 10     |
| PBANKA_0102700 | conserved Plasmodium protein                  | CFAP157       | MTOC                     | 372  | 0         | 0   | 0      | 0      | 0                | 0   | 8      | 4      |
| PBANKA_1430900 | SUN domain-containing protein                 | SUN1          | MTOC                     | 872  | 0         | 0   | 0      | 0      | 0                | 0   | 6      | 0      |
| PBANKA_1018300 | dynein intermediate chain                     | DNAI2         | MTOC                     | 592  | 2         | 5   | 2      | 1      | 0                | 3   | 5      | 9      |
| PBANKA_0104200 | calcium-binding protein                       | 104200        | MTOC                     | 157  | 0         | 0   | 0      | 0      | 0                | 0   | 4      | 3      |
| PBANKA_1035700 | WD repeat-containing protein 65               | CFAP57/WDR65  | MTOC                     | 1440 | 0         | 0   | 0      | 0      | 0                | 0   | 4      | 0      |
| PBANKA_0507800 | conserved protein                             | CFAP100       | MTOC                     | 492  | 0         | 0   | 0      | 0      | 0                | 0   | 3      | 2      |
| PBANKA_1125300 | centrosomal protein CEP135                    | CFAP58/CEP135 | MTOC                     | 906  | 0         | 0   | 0      | 0      | 0                | 0   | 3      | 0      |
| PBANKA_1312800 | CLASP domain-containing protein               | CLASP         | MTOC                     | 859  | 0         | 0   | 0      | 0      | 0                | 0   | 3      | 0      |
| PBANKA_1446000 | conserved Plasmodium protein                  | CEP104        | MTOC                     | 916  | 0         | 0   | 0      | 0      | 0                | 0   | 3      | 0      |
| PBANKA_1109600 | conserved Plasmodium protein                  | RSP9          | MTOC                     | 672  | 2         | 2   | 2      | 2      | 0                | 0   | 3      | 2      |
| PBANKA_0934700 | conserved protein                             | CFAP73/CCDC42 | MTOC                     | 362  | 0         | 0   | 0      | 0      | 0                | 0   | 2      | 3      |
| PBANKA_0504300 | flagellar outer arm dynein-associated protein | DYNLRB1       | MTOC                     | 101  | 0         | 0   | 0      | 0      | 0                | 0   | 2      | 2      |
| PBANKA_1133600 | dynein light chain                            | 1133600       | MTOC                     | 121  | 0         | 0   | 0      | 0      | 0                | 0   | 2      | 2      |
| PBANKA_0415800 | WD repeat-containing protein 66               | CFAP251       | MTOC                     | 1111 | 0         | 0   | 0      | 0      | 0                | 0   | 2      | 0      |
| PBANKA_1443000 | NIMA related kinase 1                         | NEK1          | MTOC                     | 915  | 0         | 0   | 0      | 0      | 0                | 0   | 2      | 0      |
| PBANKA_0708100 | dynein light chain 1                          | DLC1          | MTOC                     | 198  | 0         | 0   | 0      | 0      | 0                | 0   | 0      | 2      |
| PBANKA_1108000 | CFA20 domain-containing protein               | CFAP20        | MTOC                     | 364  | 0         | 0   | 0      | 0      | 3                | 4   | 0      | 3      |
| PBANKA_1454600 | nucleoporin NUP269                            | NUP269        | MTOC                     | 2260 | 0         | 0   | 0      | 0      | 0                | 0   | 7      | 0      |
| PBANKA_0100800 | zinc finger protein                           | 100800        | other                    | 1382 | 2         | 3   | 5      | 4      | 0                | 0   | 19     | 7      |
| PBANKA_0818500 | conserved protein                             | 818500        | other                    | 665  | 2         | 2   | 3      | 1      | 0                | 0   | 15     | 12     |
| PBANKA_1417900 | conserved protein                             | 1417900       | other                    | 1052 | 1         | 3   | 1      | 2      | 0                | 2   | 14     | 5      |
| PBANKA_0314200 | calcium-dependent protein kinase 1            | CDPK1         | other                    | 523  | 2         | 1   | 2      | 2      | 3                | 2   | 13     | 9      |
| PBANKA_1426500 | cullin-1                                      | CUL1          | other                    | 844  | 1         | 1   | 1      | 2      | 0                | 0   | 12     | 3      |
| PBANKA_1003400 | amino acid decarboxylase AAD                  | UIS14         | other                    | 2262 | 1         | 1   | 0      | 2      | 0                | 0   | 11     | 0      |
| PBANKA_1320100 | conserved Plasmodium protein                  | UIS25         | other                    | 789  | 0         | 0   | 0      | 0      | 0                | 2   | 10     | 5      |
| PBANKA_0933700 | mitogen-activated protein kinase 2            | MAPK2         | other                    | 523  | 0         | 0   | 0      | 0      | 0                | 2   | 7      | 7      |
| PBANKA_1129100 | DNA polymerase epsilon catalytic subunit A    | POLE-A        | DNA replication & repair | 2826 | 7         | 7   | 9      | 10     | 0                | 0   | 41     | 17     |
| PBANKA_1034100 | FANCDJ-like helicase                          | FANCDJ        | DNA replication & repair | 1063 | 3         | 4   | 10     | 7      | 0                | 0   | 31     | 13     |
| PBANKA_0613200 | DNA polymerase alpha catalytic subunit A      | POLA-A        | DNA replication & repair | 1709 | 4         | 5   | 7      | 6      | 0                | 3   | 30     | 17     |
| PBANKA_1442200 | protein SOC2                                  | SOC2          | DNA replication & repair | 5372 | 1         | 0   | 5      | 3      | 0                | 0   | 25     | 7      |
| PBANKA_0712100 | DNA helicase                                  | 712100        | DNA replication & repair | 1018 | 2         | 3   | 5      | 5      | 0                | 0   | 24     | 18     |
| PBANKA_0804300 | DNA mismatch repair protein MSH2              | MSH2-2        | DNA replication & repair | 853  | 1         | 1   | 7      | 6      | 4                | 8   | 24     | 15     |
| PBANKA_1302600 | DNA primase small subunit                     | PRIM1         | DNA replication & repair | 447  | 2         | 2   | 3      | 2      | 0                | 2   | 15     | 7      |
| PBANKA_0307100 | conserved Plasmodium protein                  | Timeless/Tof1 | DNA replication & repair | 2137 | 2         | 2   | 5      | 3      | 0                | 0   | 14     | 10     |
| PBANKA_1358300 | conserved Plasmodium protein                  | MSH2          | DNA replication & repair | 1419 | 0         | 1   | 1      | 2      | 0                | 0   | 12     | 4      |
| PBANKA_1337600 | BRCT domain-containing protein                | 1337600       | DNA replication & repair | 1265 | 1         | 0   | 3      | 3      | 0                | 0   | 11     | 5      |
| PBANKA_0812000 | DNA primase large subunit                     | PRIM2         | DNA replication & repair | 537  | 2         | 0   | 3      | 4      | 0                | 0   | 10     | 6      |
| PBANKA_1230200 | cdc2-related protein kinase 5                 | CRK5          | DNA replication & repair | 712  | 0         | 0   | 0      | 0      | 0                | 0   | 8      | 0      |
| PBANKA_1326900 | DNA polymerase alpha subunit B                | POLA-B        | DNA replication & repair | 541  | 0         | 3   | 5      | 2      | 0                | 0   | 8      | 8      |
| PBANKA_1006100 | flap endonuclease 1                           | FEN1          | DNA replication & repair | 479  | 2         | 1   | 1      | 2      | 2                | 3   | 8      | 4      |
| PBANKA_1356400 | DNA repair protein RAD5                       | RAD5          | DNA replication & repair | 1433 | 0         | 0   | 0      | 0      | 0                | 0   | 7      | 3      |
| PBANKA_0306500 | ARMT1-like domain-containing protein          | ARMT1         | DNA replication & repair | 454  | 5         | 3   | 3      | 0      | 0                | 0   | 7      | 2      |
| PBANKA_1133800 | DNA helicase                                  | 1133800       | DNA replication & repair | 867  | 0         | 0   | 0      | 0      | 0                | 0   | 6      | 3      |
| PBANKA_1349400 | DNA replication complex GINS protein          | PSF2          | DNA replication & repair | 502  | 0         | 0   | 0      | 0      | 0                | 0   | 5      | 4      |
| PBANKA_1448900 | DNA polymerase epsilon subunit B              | POLE-B        | DNA replication & repair | 623  | 1         | 0   | 1      | 2      | 0                | 0   | 5      | 2      |
| PBANKA_1344300 | chromatin assembly factor 1 subunit B         | CAF1B         | DNA replication & repair | 513  | 0         | 0   | 0      | 0      | 0                | 0   | 4      | 3      |
| PBANKA_1102900 | cell division control protein 6               | CDC6          | DNA replication & repair | 869  | 1         | 2   | 3      | 2      | 0                | 0   | 24     | 15     |
| PBANKA_1356300 | CDT1-like protein                             | CDT1          | DNA replication & repair | 955  | 4         | 5   | 0      | 5      | 0                | 0   | 19     | 8      |
| PBANKA_0312500 | origin recognition complex subunit 5          | ORC5          | DNA replication & repair | 815  | 0         | 0   | 3      | 0      | 0                | 0   | 16     | 7      |
| PBANKA_1348800 | origin recognition complex subunit 4          | ORC4          | DNA replication & repair | 885  | 2         | 0   | 3      | 4      | 0                | 0   | 12     | 8      |
| PBANKA_0513900 | ORC3 domain-containing protein                | ORC3          | DNA replication & repair | 1346 | 0         | 0   | 2      | 1      | 0                | 0   | 11     | 8      |
| PBANKA_1336900 | conserved Plasmodium protein                  | MCM10-like    | DNA replication & repair | 508  | 0         | 0   | 3      | 4      | 0                | 0   | 11     | 7      |
| PBANKA_0602000 | origin recognition complex subunit 1          | ORC1          | DNA replication & repair | 1038 | 0         | 0   | 0      | 0      | 0                | 0   | 11     | 5      |
| PBANKA_0803000 | origin recognition complex subunit 2          | ORC2          | DNA replication & repair | 781  | 1         | 1   | 4      | 2      | 0                | 0   | 10     | 4      |
| PBANKA_0202500 | nucleoside triphosphate hydrolase             | RFC-like      | DNA replication & repair | 1043 | 0         | 0   | 2      | 1      | 0                | 0   | 8      | 2      |
| PBANKA_0303300 | conserved Plasmodium protein                  | CDC45         | DNA replication & repair | 619  | 1         | 1   | 3      | 1      | 0                | 0   | 8      | 8      |

Extended Data Fig. 8

