Journal of Helminthology

Helminth communities in amphibians from Latvia with an emphasis on their connection to host ecology

Čeirāns A., Gravele E., Gavarane I., Pupins M., Mezaraupe L., Rubenina I., Kvach Y., Skute A., Oskyrko O., Nekrasova O., Marushchak O. & Kirjusina M.

Supplementary Table S1

Results of parasitological investigation into post-metamorphic and larval amphibians from Latvia: infection intensity (I), given as the range (median) of helminth counts in infected hosts; prevalence (P,%), estimated as the percentage of infected hosts (percentage of infected sites in parentheses); abundance (A), given as mean±SD per sample

| Species | *Bufo bufo* (n=53; 22 sites) | | | *Rana temporaria* (n=26; 7 sites) | | | *Rana arvalis* (n=3; 2 sites) | | | *Pelophylax* spp. (n=370; 107 sites) | | | *Pelophylax* tadpoles (n=92; 10 sites) | | | *Lissotriton vulgaris* larvae (n=249; 53 sites) | | | *Triturus cristatus* larvae (n=18; 13 sites) | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| I | P, % | A | I | P, % | A | I | P, % | A | I | P, % | A | I | P, % | A | I | P, % | A | I | P, % | A |
| **Monogenea** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Polystoma integerrimum*, ad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | <1 (1) | 0.00±0.05 | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 |
| **Trematoda** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Alaria alata*, msc | 0 | 0 | 0 | 6˗37 (17) | 12 (15) | 2.31±7.89 | 2 | 33 (50) | 0.67±1.15 | 1˗237 (4.5) | 18 (25) | 4.50±22.15 | 1˗95 (4) | 51 (9) | 4.47±12.36 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Diplodiscus subclavatus*, ad | 1-7 (1) | 6 (14) | 0.15±0.97 | 2 | 4 (15) | 0.08±0.39 | 12 | 33 (50) | 4.00±6.93 | 1˗32 (3) | 22 (29) | 1.04±3.26 | 1-2 (2) | 3 (9) | 0.05±0.31 | 1-2 (1.5) | 1 (2) | 0.01±0.14 | 0 | 0 | 0 |
| *Diplostomum spathacerum*, mtc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1˗1 (1) | <1 (2) | 0.01±0.07 | 1˗3 (1) | 3 (18) | 0.09±0.64 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Echinoparyphium recurvatum*, mtc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1˗52 (5) | 14 (21) | 1.06±4.09 | 2 | 1 (9) | 0.02±0.21 | 1-8 (1) | 4 (8) | 0.08±0.58 | 2˗2 (2) | 11 (15) | 0.22±0.65 |
| *Encyclometra colubrimurorum*, mtc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1˗27 (3) | 2 (4) | 0.19±1.71 | 1-3 (1) | 3 (9) | 0.05±0.34 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Gorgodera varsoviensis*, ad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1˗9 (1) | 5 (8) | 0.10±0.64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Haematoloechus variegatus*, ad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1˗13 (2) | 5 (12) | 0.19±1.12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Opisthioglyphe ranae*, ad | 0 | 0 | 0 | 1 | 4 (14) | 0.04±0.20 | 0 | 0 | 0 | 1˗213 (5) | 21 (38) | 2.73±13.53 | 0 | 0 | 0 | 2˗32 (7) | 4 (6) | 0.48±3.29 | 0 | 0 | 0 |
| *Opisthioglyphe ranae*, mtc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1˗47 (3) | 21 (32) | 1.38±4.90 | 1˗14 (2) | 41 (36) | 1.47±2.72 | 1˗48 (5) | 22 (26) | 2.06±6.26 | 1˗4 (2) | 16 (15) | 0.39±1.04 |
| *Opisthioglyphe ranae*, all stages | 0 | 0 | 0 | 1 | 4 (14) | 0.04±0.20 | 0 | 0 | 0 | 1˗243 (4) | 33 (54) | 4.11±15.49 | 1˗14 (2) | 41 (36) | 1.47±2.72 | 1-50 (5) | 23 (26) | 2.54±7.52 | 1˗4 (2) | 16 (15) | 0.39±1.04 |
| *Paralepoderma cloacicola*, mtc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1˗112 (3) | 4 (6) | 0.52±6.17 | 3˗11 (7) | 3 (18) | 0.15±1.19 | 1˗27 (4.5) | 14 (23) | 0.79±2.94 | 0 | 0 | 0 |
| *Pleurogenes claviger*, ad | 1 | 2 (5) | 0.02±0.14 | 1 | 4 (14) | 0.04±0.20 | 0 | 0 | 0 | 1˗53 (4) | 4 (11) | 0.48±4.19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Pleurogenoides medians*, ad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1˗186 (3) | 9 (11) | 2.08±15.35 | 0 | 0 | 0 | 5˗8 (7) | 1 (4) | 0.08±0.74 | 0 | 0 | 0 |
| *Prosotocus confusus*, ad | 0 | 0 | 0 | 1 | 4 (14) | 0.04±0.20 | 0 | 0 | 0 | 1˗37 (6) | 2 (7) | 0.24±2.41 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Skrjabinoeces similis,* ad | 0 | 0 | 0 | 1˗8 (4.5) | 8 (14) | 0.35±1.57 | 0 | 0 | 0 | 1˗33 (2) | 25 (47) | 0.90±2.75 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Strigea falconis*, mtc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1˗49 (10.5) | 1 (4 | 0.19±2.75 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Strigea sphaerula*, mtc | 2 | 2 (5) | 0.04±0.27 | 1˗11 (6) | 8 (14) | 0.46±2.16 | 0 | 0 | 0 | 1˗35 (4) | 4 (12) | 0.32±2.37 | 0 | 0 | 0 | 1˗5 (1) | 5 (11) | 0.09±0.48 | 1 | 6 (8) | 0.06±0.24 |
| *Strigea strigis*, mtc | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1˗259 (5) | 11 (23) | 1.98±14.71 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Tylodelphys excavata*, mtc | 0 | 0 | 0 | 0 |  | 0 | 0 | 0 | 0 | 1˗180 (5) | 15 (23) | 2.76±15.72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Cestoda** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cestoda, ad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | <1 (1) | 0.02±0.42 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cestoda, larv | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 (9) | 0.02±0.21 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Nematoda** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Cosmocera ornata*, ad | 1 | 2 (5) | 0.04±0.27 | 0 | 0 | 0 | 0 | 0 | 0 | 1˗8 (1) | 8 (15) | 0.15±0.71 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Gyrinicola tba,* ad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1-5 (1) | 4 (27) | 0.09±0.55 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Hedruris androphora,* ad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1˗2 (1) | 3 (11) | 0.03±0.20 | 1˗8 (3) | 28 (31) | 1.11±2.25 |
| *Heligmosomoides polygyrus*, ad | 4-12 (6) | 6 (14) | 0.42±1.90 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | <1 (1) | 0.04±0.83 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Neoraillietnema praeputiale*, ad | 3˗35 (9) | 81 (82) | 9.96±10.62 | 1˗22 | 50 (29) | 2.19±4.49 | 5 | 33 (50) | 1.67±2.89 | 1˗21 (2) | 9 (21) | 0.30±1.50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Oswaldocruzia filiformis*, ad | 1˗97 (8) | 81 (82) | 10.53±17.51 | 1˗31 (3.5) | 62 (72) | 3.54±6.51 | 1˗3 (2) | 67 (100) | 1.33±1.53 | 1˗33 (2) | 9 (13) | 0.40±2.46 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Rhabdias bufonis*, ad | 1˗29 (6) | 77 (86) | 5.98±6.53 | 1˗15 (2) | 50 (54) | 2.54±4.29 | 1 | 33 (50) | 0.33±0.58 | 1 | <1 (1) | 0.00±0.05 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Acantocephala** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| *Acanthocephalus ranae*, ad | 1˗29 (1.5) | 8 (14) | 0.62±3.99 | 2 | 4 (14) | 0.08±0.39 | 0 | 0 | 0 | 1˗6 (1) | 9 (14) | 0.17±0.67 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Parasite stage abbreviations: msc – mesocercariae, mtc – metacercariae, larv – larvae, ad – adults

Supplementary Table S2

Helminth predilection sites in post-metamorphic *Pelophylax* spp*.* frogs (n=370) (total count; I, average, ± SD in parentheses)

| Helminth species, stage | Stomach\* | Intestine\* | Cloaca\* | Urine bladder | Liver\* | Lungs\* | Kidneys | Eyes | Brain & spinal cord | Under skin | Serosa of internal organs | Body cavity | Walls of the mouth cavity | Other muscles |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Polystoma integerrimum*, ad |  |  |  |  |  |  |  |  |  |  |  | 1 (1) |  |  |
| *Alaria alata*, msc | 7 (2.3±1.5) | 309 (14.1±20.8) |  |  | 441 (46.7±42.1) | 8 (8) | 24 (24) |  |  | 264 (8.5±12.4) | 646 (15.3±25.7) | 55 (7.9±10.5) | 13 (3.1±4.3) |  |
| *Diplodiscus subclavatus*, ad | 2 (1.0±0.0) | 309 (4.6±5.7 | 129 (6.1±11.3) |  |  |  |  |  |  |  |  | 2 (1.0±0.0) |  |  |
| *Diplostomum spathacerum*, mtc |  |  |  |  |  |  |  | 1 (1) |  | 1 (0) |  |  |  |  |
| *Echinoparyphium recurvatum*, mtc |  |  |  |  |  |  |  | 78 (6.0±5.0) | 7 (2.3±2.3) | 301 (6.9±8.7) | 9 (4.5±4.9) |  |  |  |
| *Encyclometra colubrimurorum*,mtc |  | 9 (2.3±1.0) |  |  |  |  |  |  |  | 3 (3) | 67 (11.2±8.6) |  | 18 (9.0±1.0) |  |
| *Gorgodera varsoviensis*, ad | 2 (2) | 18 (2.0±2.6) |  | 5 (1.0±0.0) |  |  |  |  |  |  | 2 (1.0±0.0) | 10 (5.0±1.0) |  |  |
| *Haematoloechus variegatus*, ad |  |  |  |  |  | 70 (3.7±3.4) |  |  |  |  |  |  | 2 (2) |  |
| *Opisthioglyphe ranae*, ad | 3 (1.5±0.5) | 950 (12.1±17.9) | 28 (7.0±8.4) |  |  |  |  |  |  |  | 1 (1) | 3 (1.0±0.0) |  |  |
| *Opisthioglyphe ranae*, mtc | 18 (3.6±2.1) | 145 (5.8±9.3) | 22 (7.3±10.1) |  | 1 (1) |  |  | 5 (1.3±0.5) |  | 86 (3.2±2.1) | 248 (8.4±6.5) |  | 1 (1) |  |
| *Paralepoderma cloacicola*, mtc |  | 19 (2.7±2.1) |  |  |  |  |  |  |  |  | 165 (23.6±35.5) |  | 9 (9) | 2 (2) |
| *Pleurogenes claviger*, ad | 1 (1) | 165 (11.8±17.2) |  |  |  |  |  |  |  |  | 9 (4.5±4.9) |  |  |  |
| *Pleurogenoides medians*, ad |  | 776 (21.6±45.3) |  |  |  |  |  |  |  |  |  | 1 (1) |  |  |
| *Prosotocus confusus*, ad | 30 (7.5±9.4) | 115 (16.4±16.5) |  |  |  |  |  |  |  |  |  |  | 5 (1.6±0.6) |  |
| *Skrjabinoeces similis*, ad | 1 (1) |  |  |  |  | 338 (3.6±4.5) |  |  |  |  |  |  |  |  |
| *Strigea falconis*, mtc |  | 1 (1) |  |  |  |  |  |  |  |  | 62 (31.0±15.6) |  | 7 (7) | 1 (1) |
| *Strigea sphaerula*, mtc |  | 44 (5.5±6.0) | 1 (1) |  |  |  |  |  |  |  | 74 (6.7±5.8) |  |  |  |
| *Strigea strigis*, mtc |  | 1 (1) |  |  |  |  |  |  |  |  | 404 (14.4±41.6) |  |  |  |
| *Tylodelphys excavata*, mtc |  | 11 (2.2±1.3) |  |  |  |  |  |  | 580 (16.6±36.9) | 51 (5.7±6.3) | 380 (23.4±43.1) |  |  |  |
| Cestoda indet, ad |  |  |  |  |  |  |  |  |  |  | 6 (4.0±2.8) |  |  |  |
| *Cosmocerca ornata*, ad | 3 (2) | 34 (1.7±1.4) | 15 (2.5±1.9) |  |  |  |  | 2 (2) |  |  |  | 2 (1.0±0.0) |  |  |
| *Heligmosomoides polygyrus*, ad |  | 16 (16) |  |  |  |  |  |  |  |  |  |  |  |  |
| *Neoraillietnema praeputiale*, ad | 2 (1.0±0.0) | 88 (2.9±3.8) | 30 (3.3±3.1) |  |  |  |  |  |  |  |  |  |  |  |
| *Oswaldocruzia filiformis*, ad | 7 (1.2±0.4) | 135 (4.5±7.5) | 6 (2.0±1.0) |  |  |  |  |  |  |  |  |  |  |  |
| *Rhabdias bufonis*, ad |  |  |  |  |  | 1 (1) |  |  |  |  |  |  |  |  |
| *Acanthocephalus ranae*, ad | 1 (1) | 62 (1.81.2) | 1 (1) |  |  |  |  |  |  |  |  |  |  |  |

\* include all their cavities and walls except serosa

Supplementary Table S3

Helminth predilection sites in post-metamorphic *Bufo bufo* toads (n=53), *Rana arvalis* (n=3), and *R.temporaria* (n=26) frogs (total count; I, average, ± SD in parentheses)

| Host | Helminth species, stage | Stomach\* | Intestine\* | Cloaca\* | Gall bladder | Lungs\* | Serosa of internal organs | Walls of the mouth cavity | Under skin |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Bufo bufo* | *Diplodiscus subclavatus*, ad |  | 9 (3.0±3.5) |  |  |  |  |  |  |
| *Pleurogenes claviger*, ad |  | 1 (1) |  |  |  |  |  |  |
| *Strigea sphaerula*, mtc |  |  |  |  |  | 2 (2) |  |  |
| *Cosmocerca ornata*, ad |  | 1 (1) |  |  |  |  |  |  |
| *Heligmosomoides polygyrus*, ad |  | 22 (7.3±4.2) |  |  |  |  |  |  |
| *Neoraillietnema praeputiale*, ad | 10 (10) | 485 (10.8±10.2) | 25 (25) | 13 (4.3±5.8) |  |  | 1 (1) |  |
| *Oswaldocruzia filiformis*, ad | 2 (2) | 526 (11.4±16.0) |  |  |  |  |  |  |
| *Rhabdias bufonis*, ad |  |  |  |  | 317 (7.6±6.4) |  |  |  |
| *Acanthocephalus ranae*, ad |  | 33 (8.3±13.8) |  |  |  |  |  |  |
| *Rana arvalis* | *Alaria alata*, msc |  |  |  |  |  |  |  | 2 (2) |
| *Diplodiscus subclavatus*, ad |  | 8 (8) | 4 (4) |  |  |  |  |  |
| *Neoraillietnema praeputiale*, ad |  | 5 (5) |  |  |  |  |  |  |
| Oswaldocruzia filiformis, ad |  | 3 (3) | 1 (1) |  |  |  |  |  |
| *Rhabdias bufonis*, ad |  |  |  |  | 1 (1) |  |  |  |
| *Rana temporaria* | *Alaria alata*, msc |  | 6 (6) |  |  |  | 12 (6.0±7.1) |  | 42 (21.0±21.2) |
| *Diplodiscus subclavatus*, ad |  | 2 (2) |  |  |  |  |  |  |
| *Opisthioglyphe ranae*, ad |  | 1 (1) |  |  |  |  |  |  |
| *Pleurogenes claviger*, ad |  | 1 (1) |  |  |  |  |  |  |
| *Prosotocus confusus*, ad |  | 1 (1) |  |  |  |  |  |  |
| *Skrjabinoeces similis*, ad |  |  |  |  | 9 (4.5±4.9) |  |  |  |
| *Strigea sphaerula*, mtc |  | 12 (6.0±7.1) |  |  |  |  |  |  |
| *Neoraillietnema praeputiale*, ad | 1 (1) | 51 (3.4±2.6) |  |  |  |  |  |  |
| *Oswaldocruzia filiformis*, ad |  | 92 (5.4±5.2) |  |  |  |  |  |  |
| *Rhabdias bufonis*, ad |  |  |  |  | 66 (4.5±4.9) |  |  |  |
| *Acanthocephalus ranae*, ad |  | 2 (2) |  |  |  |  |  |  |

\* include all their cavities and walls except serosa

Supplementary Table S4

Helminth predilection sites in *Pelophylax* spp*.* tadpoles (n=92) (total count; I, average, ± SD in parentheses)

| Helminth species, stage | Eyes | Body cavity | Under skin | Tail muscles | Hind leg muscles | Intestine\* | Mesentery | Serosa of internal organs |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Alaria alata*, msc | 4 (1.0±0.0) | 42 (2.9±2.7) | 536 (7.8±15.1) |  | 8 (2.0±1.4) | 9 (4.5±4.9) |  | 8 (2.0±1.4) |
| *Diplostomum spathacerum*, mtc | 2 (1.0±0.0) |  |  |  |  |  |  |  |
| *Encyclometra colubrimurorum*, mtc |  |  |  | 1 (1) |  |  |  |  |
| *Opisthioglyphe ranae*, mtc | 1 (1) | 6 (1.5±0.6) | 17 (1.8±0.9) | 20 (6.0±5.6) |  |  | 13 (4.3±4.0) | 62 (3.3±3.3) |
| *Paralepoderma cloacicola*, mtc |  |  |  |  |  |  |  | 3 (3) |
| *Gyrinicola tba*, ad |  |  |  |  |  | 2 (2) |  |  |

\* include all their cavities and walls except serosa

Supplementary Table S5

Helminth predilection sites in larval *Lissotriton vulgaris* (n=249) and *Triturus cristatus* (n=18) (total count; I, average, ± SD in parentheses)

| Host | Helminth species, stage | Around eyes | Body cavity | Under skin | Muscles | Stomach\* | Intestine\* | Serosa of internal organs |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Lissotriton vulgaris* | *Diplodiscus subclavatus*, ad |  |  |  |  |  | 3 (1.5±0.5) |  |
| *Echinoparyphium recurvatum*, mtc |  |  | 4 (1.3±0.6) |  |  |  | 13 (2.8±3.0) |
| *Opisthioglyphe ranae*, ad |  |  |  |  |  | 120 (12.0±12.0) |  |
| *Opisthioglyphe ranae*, mtc | 3 (1.5±0.5) | 59 (29.5±12.0) | 111 (8.5±6.7) |  |  | 9 (4.5±0.5) | 39 (4.3±4.5) |
| *Paralepoderma cloacicola*, mtc |  |  | 6 (6) | 91 (6.5±3.8) |  | 3 (1.0±0.0) | 18 (3.0±2.5) |
| *Pleurogenoides medians*, ad |  |  |  |  |  | 20 (6.7±1.5) |  |
| *Strigea sphaerula*, mtc |  |  | 3 (1.5±0.5) |  |  |  | 17 (2.8±2.0) |
| *Hedruris androphora*, ad |  |  |  |  | 1 (1) | 4 (1.3±0.5) |  |
| *Triturus cristatus* | *Echinoparyphium recurvatum*, mtc |  |  | 4 (2.0±0.0) |  |  |  |  |
| *Opisthioglyphe ranae*, mtc |  |  | 5 (1.7±0.6) |  |  |  | 2 (2) |
| *Strigea sphaerula*, mtc |  |  |  |  |  |  | 1 (1) |
| *Hedruris androphora*, ad |  |  |  |  | 3 (3) | 17 (4.3±3.0) |  |

\* include all their cavities and walls except serosa

Supplementary Table S6

Kendall rank correlation for helminth species associations matrix; tau-b in the upper right section and level of significance (P) in the lower left section

|  | A.alat, msc | D.subc, ad | D.spha, mtc | E.recu, mtc | E.colu, mtc | G.vars, ad | H.vari, ad | O.rana,mtc | O.rana,ad | P.cloa, mtc | P.clav, ad | P.medi, ad | P.conf, ad | S.simi, ad | S.falc, mtc | S.spha, mtc | S.stri, mtc | T.exca, mtc | C.orna | G.tba | H.andr | H.poly | N.prae | O.fili | R.bufo | A.rana |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A.alat, msc | X | 0.1857 | 0.0972 | 0.1623 |  |  | 0.0900 | 0.1771 |  |  |  | 0.2168 | 0.1021 |  |  |  | 0.2563 |  | 0.0974 |  |  |  |  |  |  | 0.1733 |
| D.subc, ad | 0.0000 | X |  | 0.2444 |  | 0.1040 | 0.1468 | 0.0953 | 0.2423 |  |  | 0.3334 | 0.1487 | 0.1284 |  |  | 0.2213 | 0.1062 | 0.2005 |  |  |  | 0.1171 | 0.1963 |  | 0.2345 |
| D.spha, mtc | 0.0041 |  | X |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| E.recu, mtc | 0.0000 | 0.0000 |  | X |  |  | 0.0763 | 0.1897 | 0.1054 |  |  | 0.2683 |  | 0.0845 |  |  | 0.1164 |  | 0.0891 | 0.0728 |  |  |  |  | -0.0779 | 0.1079 |
| E.colu, mtc |  |  |  |  | X | 0.1858 |  |  |  |  |  | 0.0732 |  | 0.1466 |  |  | 0.1123 |  | 0.0843 |  |  |  |  |  |  |  |
| G.vars, ad |  | 0.0023 |  |  | 0.0000 | X |  |  | 0.1059 |  | 0.2033 |  |  | 0.2037 |  |  | 0.1087 |  | 0.1876 |  |  |  |  |  |  | 0.0813 |
| H.vari, ad | 0.0077 | 0.0000 |  | 0.0262 |  |  | X | 0.0727 |  |  |  | 0.0855 |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.1175 |
| O.rana,mtc | 0.0000 | 0.0036 |  | 0.0000 |  |  | 0.0291 | X |  | 0.0963 |  | 0.0854 |  |  |  |  |  |  |  |  |  |  | -0.1318 | -0.0888 | -0.1310 |  |
| O.rana,ad |  | 0.0000 |  | 0.0017 |  | 0.0019 |  |  | X |  | 0.1156 |  | 0.1412 | 0.1942 |  |  | 0.0790 |  | 0.0832 |  |  |  |  |  | -0.0779 | 0.2234 |
| P.cloa, mtc |  |  |  |  |  |  |  | 0.0036 |  | X |  |  |  |  |  |  |  |  |  |  |  |  | -0.0729 | -0.0886 | -0.0673 |  |
| P.clav, ad |  |  |  |  |  | 0.0000 |  |  | 0.0007 |  | X |  | 0.2185 | 0.1365 |  | 0.1028 |  |  |  |  |  |  |  |  |  | 0.1310 |
| P.medi, ad | 0.0000 | 0.0000 |  | 0.0000 | 0.0346 |  | 0.0134 | 0.0100 |  |  |  | X |  | 0.0921 |  |  | 0.2173 |  | 0.1510 |  |  |  |  |  |  | 0.1759 |
| P.conf, ad | 0.0026 | 0.0000 |  |  |  |  |  |  | 0.0000 |  | 0.0000 |  | X | 0.1623 |  |  | 0.0748 |  |  |  |  |  |  |  |  | 0.0812 |
| S.simi, ad |  | 0.0000 |  | 0.0121 | 0.0000 | 0.0000 |  |  | 0.0000 |  | 0.0001 | 0.0067 | 0.0000 | X | 0.1369 |  | 0.1729 |  | 0.2371 |  |  |  |  |  | -0.0669 | 0.0811 |
| S.falc, mtc |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.0001 | X |  |  |  |  |  |  |  |  |  |  |  |
| S.spha, mtc |  |  |  |  |  |  |  |  |  |  | 0.0030 |  |  |  |  | X |  | 0.0672 |  |  |  |  |  |  |  |  |
| S.stri, mtc | 0.0000 | 0.0000 |  | 0.0006 | 0.0012 | 0.0017 |  |  | 0.0192 |  |  | 0.0000 | 0.0304 | 0.0000 |  |  | X |  | 0.1627 |  |  |  |  | 0.0790 |  | 0.1296 |
| T.exca, mtc |  | 0.0017 |  |  |  |  |  |  |  |  |  |  |  |  |  | 0.0500 |  | X |  |  |  |  | 0.0784 |  | -0.0714 |  |
| C.orna | 0.0039 | 0.0000 |  | 0.0093 | 0.0153 | 0.0000 |  |  | 0.0145 |  |  | 0.0000 |  | 0.0000 |  |  | 0.0000 |  | X |  |  |  |  | 0.0850 |  | 0.1113 |
| G.tba |  |  |  | 0.0346 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | X |  |  |  |  |  |  |
| H.andr |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | X |  |  |  |  |  |
| H.poly |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | X | 0.1968 | 0.1363 | 0.1892 |  |
| N.prae |  | 0.0005 |  |  |  |  |  | 0.0001 |  | 0.0306 |  |  |  |  |  |  |  | 0.0198 |  |  |  | 0.0000 | X | 0.6008 | 0.6561 | 0.0686 |
| O.fili |  | 0.0000 |  |  |  |  |  | 0.0065 |  | 0.0086 |  |  |  |  |  |  | 0.0193 |  | 0.0123 |  |  | 0.0001 | 0.0000 | X | 0.5993 | 0.1644 |
| R.bufo |  |  |  | 0.0216 |  |  |  | 0.0001 | 0.0213 | 0.0483 |  |  |  | 0.0475 |  |  |  | 0.0357 |  |  |  | 0.0000 | 0.0000 | 0.0000 | X |  |
| A.rana | 0.0000 | 0.0000 |  | 0.0016 |  | 0.0192 | 0.0007 |  | 0.0000 |  | 0.0002 | 0.0000 | 0.0194 | 0.0172 |  |  | 0.0002 |  | 0.0013 |  |  |  | 0.0431 | 0.0000 |  | X |