

SUBSTRATE AND HABITAT PREFERENCES OF TWO COMMON SPECIES OF *Microporus* p. BEAUV. (BASIDIOMYCOTA, POLYPORALES) IN TROPICAL FORESTS OF VIETNAM

E. S. POPOV ^(1, 2), A. V. ALEXANDROVA ^(2, 3), E. A. ANTONOV ^(2, 3)

1. INTRODUCTION

Macrofungi of the order Polyporales are important decomposers of woody debris and play a very important role in recycling the organic matter in forest ecosystems [1, 2]. At the same time, polypores cause economic losses by destroying the wood in living trees, logs and in harvested timber. Many of wood-decaying fungi show specificity or preference for substrate having certain characteristics, for example, substrate size, destruction stage etc. In boreal and temperate areas, niches of wood-decaying basidiomycetes are differentiated according to substrate and habitat conditions [3÷6]. However, there is limited information on substrate and habitat preferences among polypores in Tropical Asia [7÷9]. Here, we examine niche differentiation of *Microporus affinis* (Blume & T. Nees) Kuntze and *M. xanthopus* (Fr.) Kuntze, two common paleotropical generalist polypores, widely distributed in most types of tropical forests of Vietnam [10÷12].

2. MATERIAL AND METHODS

The material was obtained during expeditions in October/November 2018, April/May 2019 and November/December 2019 in the national parks and nature reserves of Bu Gia Map (Binh Phuoc), Cat Tien (Dong Nai), Phia Oac - Phia Den (Cao Bang), Song Thanh (Quang Nam) and Pu Hoat (Nghe An). All occurrences of *M. affinis* and *M. xanthopus* were recorded along the routes in various types of forest communities. Multiple basidiomata of the same species growing on an individual tree or log were considered one occurrence. For each occurrence, using the NextGIS Mobile application (<http://nextgis.ru/nextgis-mobile>) the following substrate and habitat ranked variables were estimated and recorded:

- Elevation above sea level (m) assigned to one of 5 height classes (1 - 0-250 m, 2 - 251-500 m, 3 - 501-750 m, 4 - 751-1000 m, and 5 - 1001-1500 m);
- The type of the woody debris (wind-broken tree, log, snag, fallen branch, roots);
- Size class of woody debris 1) <0.5 cm, 2) <1 cm, 3) <3 cm, 4) <5 cm, 5) <10 cm, 6) <30 cm, 7) <50 cm, 8) > 50 cm;
- The stage of wood destruction based on classification proposed in [4]: 1) wood hard, a knife penetrates only a few mm into the wood, bark intact, twigs (diam. 1 cm) intact; 2) wood rather hard, a knife penetrates less than 1 cm into the wood, bark starting to break up, twigs ±lost, branches (diam 1-4 cm) intact; 3) wood distinctly softened, knife penetrates ca. 1-4 cm into the wood, bark partly lost, branches ±lost, original log circumference intact; 4) wood strongly decayed, knife penetrates ca. 5-10 cm into the wood, bark lost in most places, original log

circumference disintegrating; 5) wood very strongly decayed, either to a very soft crumbly substance, or being flaky and fragile, knife penetrates in most places more than 10 cm into the wood, original log circumference not or hardly recognizable;

- Insolation of habitats: 1) not protected by anything from direct sun during most of the daylight hours, 2) at least half of the daylight hours, the substrate is in direct sun, 3) rather bright diffuse lighting for most of the daylight hours, 3) weak diffuse lighting during most of the daylight hours, 4) almost complete absence of light.

The number of species occurrences per each value of an estimated variable was counted, and mean score then was calculated for all variables except of the type of the woody debris. Means were compared using the Student's t-test. Correlation between number of occurrences of *M. affinis* and *M. xanthopus* regarding estimated ranked variables were detected by Spearman's rank correlation coefficient.

3. RESULTS AND DISCUSSION

Both *M. affinis* and *M. xanthopus* (Fig. 1) were among the most common wood-decomposers in studied areas.

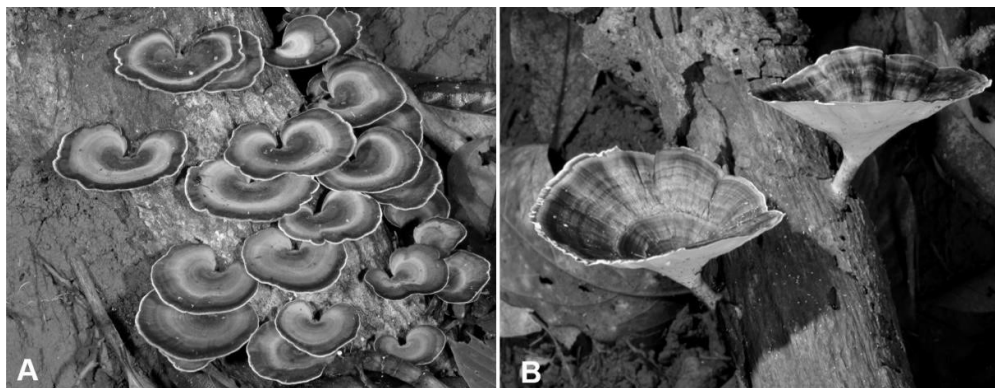


Fig. 1. Basidiomata of *Microporus affinis* (A) and *M. xanthopus* (B) *in situ*

We recorded 72 occurrences of *M. affinis* and 55 occurrences of *M. xanthopus*. For additional 23 occurrences of *M. xanthopus* from Cat Tien National Park, only elevation, substrate size class and type of the woody debris were estimated.

As can be seen from Fig. 2 the number of occurrences of *Microporus affinis* was higher on high elevations and lower on lowlands, compared with *M. xanthopus*. Most records of *M. affinis* were confined to logs lying on or above the ground; on fallen branches it was observed twice less often. *M. xanthopus* clearly preferred branches to logs (70 vs 8 occurrences). The opposite tendencies were also revealed by the distribution of occurrences of these species according to the size classes of the substrate. The preference to small-sized substrata was also shown for *M. xanthopus* in tropical forests of peninsular Malaysia [7] and Kerala State of India [8, 9]. Both species tended to occur in well-lit habitats and did not show noticeable preferences in terms of wood destruction stage forming basidiomata on slightly as well as highly decomposed wood, though *M. xanthopus* was more numerous on later stages of wood decay.

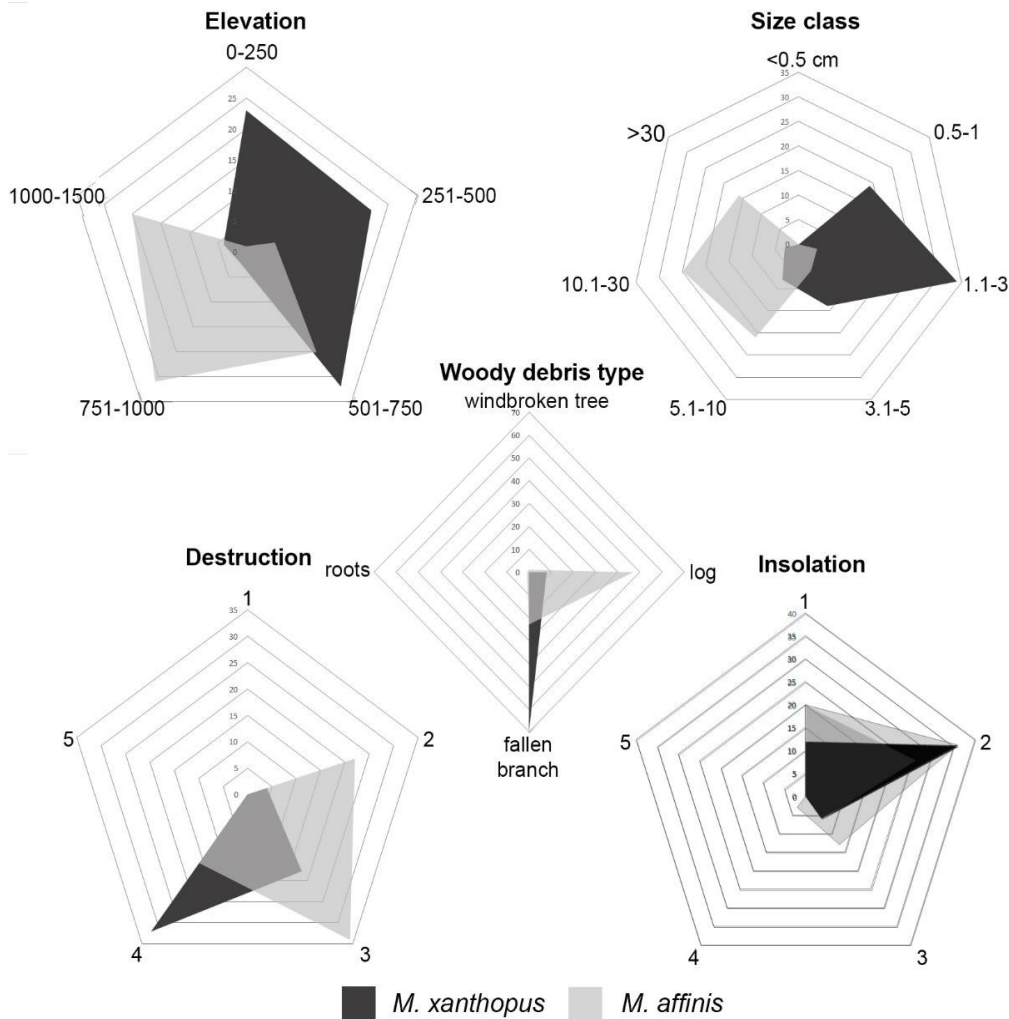


Fig. 2. Star plots of occurrences distribution of *Microporus affinis* and *M. xanthopus* regarding estimated variables

The Student's t-test at significance level 0.05 shows statistically significant differences in mean habitat elevation, substrate size class and destruction between *M. affinis* and *M. xanthopus* (Table 2). There was no significant difference in preferable insolation level between two species. The Spearman's rank correlation coefficient shows weak to moderate negative correlation in distribution of occurrences among preferable substrate size classes and in elevation classes, i.e. the opposite tendencies in frequency of records observed in these species. For degree of substrate decomposition or in level of habitat insolation, the correlation was positive, which indicates the similarity of the trend in the change in the occurrence of both species depending on these factors (Table 2).

Table 2. Comparison of *Microporus affinis* and *M. xanthopus* with regard to estimated variables by the Student's t-test (*t*) and Spearman's rank correlation coefficient (*r_s*) at 0.05 significance level

Habitat variables	<i>Microporus affinis</i> mean score	<i>Microporus xanthopus</i> mean score	<i>t</i>	<i>r_s</i>
Elevation class	3.8	2.2	9.58	-0.53
Size class	5.6	3.2	13.23	-0.24
Degree of destruction	2.9	3.5	4.48	+0.69
Insolation	2.0	1.9	0.66	+1

Note: Values in bold denote statistical significance at the 0.05 level.

4. CONCLUSION

We analyzed niche differentiation of two closely related wood-decaying polypores *Microporus affinis* and *M. xanthopus* according to a number of substrate and habitat variables. Based on the data collected during field studies, differences in ecological preferences between two species of the genus *Microporus* with respect to the substrate size and degree of destruction are shown:

- *M. xanthopus* colonize more strongly decayed, small to medium-sized woody debris, such as fallen branches with a diameter of 1-3 cm, while *M. affinis* prefers large-sized logs on earlier stages of decomposition.
- The two species also show statistically significant differences in their distribution along altitudinal gradient with *M. xanthopus* being more common at lower elevation in lowland and submontane forests, while *M. affinis* shows a higher occurrence rate in montane forests.
- There was no significant difference between two species in preferable level of habitat insolation.

Acknowledgements: We are grateful to Drs. Andrei N. Kuznetsov and Nguyen Dang Hoi, and to Svetlana P. Kuznetsova (Joint Vietnam-Russian Tropical Research and Technological Centre, Hanoi, Vietnam) for supporting our fieldwork in Vietnam. The study was carried out in the context of a long-term project E-1.5 "Taxonomic and ecological diversity of mycobiota in the Vietnamese rainforest" by JRVTC and within the framework of the institutional research projects no. AAAA-A19-119020890079-6 "Biodiversity, ecology and structural and functional features of fungi and mushroom-like protists" of the Komarov Botanical Institute of the Russian Academy of Sciences.

REFERENCES

1. Горчаковский П. Л., *Экология процессов биологического разложения древесины*, Екатеринбург: «Екатеринбург», 2000, 152 с.
2. Boddy L., *Fungal community ecology and wood decomposition processes in angiosperms: from standing tree to complete decay of coarse woody debris*, Ecological Bulletins, 2001, **49**:43-56.
3. Renvall P., *Community structure and dynamics of wood-rotting Basidiomycetes on decomposing conifer trunks in Northern Finland*, Karstenia, 1995, **35**:1-51.
4. Heilmann-Clausen J., *A gradient analysis of communities of macrofungi and slime moulds on decaying beech logs*, Mycological Research, 2001, **105**(5):575-596.
5. Heilmann-Clausen J., Christensen M., *Does size matter?: On the importance of various dead wood fractions for fungal diversity in Danish beech forests*, Forest Ecology and Management, 2004, **201**(1):105-117.
6. Takahashi K. H., Kagaya T., *Guild structure of wood-rotting fungi based on volume and decay stage of coarse woody debris*, Ecological Research, 2005, **20**:215-222.
7. Hattori T., See L. S., *Community Structure of Wood-Decaying Basidiomycetes in Pasoh*, Pasoh: Ecology of a Lowland Rain Forest in Southeast Asia. Springer Japan, 2003, p. 161-170.
8. Iqbal M., Vidyasagaran K., Ganesh N., *Influence of substrate features on distribution of polypores (Fungi: Basidiomycota) in central part of Peechi Vazhani Wildlife Sanctuary, Kerala, India*, Journal of Threatened Taxa, 2017a, **9**(1):9689-9699.
9. Iqbal A. M., Vidyasagaran K., Ganesh N., *Host specificity of some wood decaying-fungi in moist deciduous forests of Kerala, India*, Journal of Threatened Taxa, 2017b, **9**(4):10096-10101.
10. Trịnh Tam Bảo, Graefe U., Trịnh Tam Kiệt, *Nghiên cứu chi nấm ông nhỏ Microporus ở Việt Nam*, Tạp chí Di truyền học và ứng dụng, 2009, **5**:31-34.
11. Trịnh Tam Kiệt, *Nấm lớn ở Việt Nam (Tập 1)*, Nxb. Khoa học tự nhiên và công nghệ, Hà Nội, 2011, 314 tr.
12. Trịnh Tam Kiệt, *Danh lục Nấm lớn ở Việt Nam*, Nxb. ĐHQGHN, Hà Nội, 2014, 380 tr.

SUMMARY

SUBSTRATE AND HABITAT PREFERENCES OF TWO COMMON SPECIES OF *Microporus* p. BEAUV. (BASIDIOMYCOTA, POLYPORALES) IN TROPICAL FORESTS OF VIETNAM

We analyzed niche differentiation of closely related wood-decaying polypores *Microporus affinis* and *M. xanthopus* in tropical forests of Vietnam. The statistical analysis confirms differences between *M. affinis* and *M. xanthopus* regarding preferable substrate size, average habitat elevation above the sea level, and degree of substrate decomposition, while there was no significant difference between two species in preferable level of habitat insolation.

Keywords: *Fungi, polypores, wood, ecology, ecological niche.*

Nhận bài ngày 29 tháng 6 năm 2021

Phản biện xong ngày 07 tháng 10 năm 2021

Hoàn thiện ngày 14 tháng 10 năm 2021

(1) Komarov Botanical Institute, Russian Academy of Sciences

(2) Joint Vietnam-Russian Tropical Research and Technological Centre

(3) Moscow State Lomonosov University, Department of Biology