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### NOTES ON THE TAXONOMY AND NOMENCLATURE OF *BELONIDIUM*, *TRICHOPEZIZA* AND *LACHNUM* (*HYALOSCYPHACEAE*) IN THE LIGHT OF THE HOMOLOGOUS SERIES CONCEPT

The author has recently discussed Vavilov's law of homologous series as a factor responsible for the species diversity in the genera of the *Discomycetes* (Райтвийр, 1984). N. Vavilov himself has pointed out that the law of homologous series creates a theoretical framework for the taxonomy of living organisms and enables a taxonomist to understand the meaning and order of the existing diversity of taxa of different rank. He has also suggested that the existing classifications of various groups should be re-evaluated to a great extent (Вавилов, 1967).

Some interesting applications in the second direction could be found in the studies by L. Vassilyeva (Васильева, 1983, 1985). She has analysed the homologous series in the genera *Hypoxyton* (*Xylariaceae*) and *Scutellinia* (*Humariaceae*) and discussed the homologous variability in various Pyrenomycetes. She was able to show that if the species of the mentioned genera were placed into the network pattern reflecting the homologous series, one could question some taxonomic decisions of the monographers of those genera on the species and variety level. It seems that both J. H. Miller (1961) and B. B. Kullman (Куллман, 1982) have described several species of *Hypoxyton* and *Scutellinia* in the varietal rank and that a species of *Scutellinia* should be reduced to the varietal rank. There is no doubt that the taxonomy of various confused groups could be cleared up if the general regularities of diversity and similarity on various taxonomic levels were searched for on the basis of the law of homologous series.

At the same time it is evident that the law of homologous series does not express itself to a full extent in all related genera or families. In fungi it could be demonstrated effectively only in a rather limited number of model genera in each family. S. I. Rozanov (Розанов, 1986) has discussed the ways of origin of homologous series and claimed that the reserve of recessive hereditary variability is responsible for the arrangement of species into homologous series. He has pointed out that the almost totally filled series occur rather as an exception than a rule and that the series are more filled in younger taxonomic groups than in older ones. He has also stressed that the presence of homologous series is a proof of monophyly of a taxonomic group.

The author of the present paper (Райтвийр, 1984) has suggested the close relationship between three genera of the *Hyaloscyphaceae* — *Belonidium*, *Lasiobelonium* and *Trichopezizella* — which very probably share

a common ancestor on the basis of homologous features manifesting themselves in all these genera. Now I shall discuss this point in greater detail.

There are two striking homologous features in these genera. (1) All graminicolous species of these genera have 2-celled spores but there are no species with 2-celled spores on other substrata. (2) The species of these genera are sessile to substipitate but there exists a distinctly stipitate species in a rather exceptional ecological niche for the genus in each one: *Belonidium atropurpureum* (Dur.) Raitv. on Eucalyptus bark in California, *Trichopezizella otanii* Haines on Sakhalin tall-grass plants in East Asia and *Lasiobelonium stipitatum* Raitv. on subalpine tall-grass plants in the Tien-Shan Mountains.

On the basis of those facts I conclude that these three genera very probably share a common ancestor and form a closely related monophyletic group. The fact that the homologous series are filled to a great extent in *Belonidium*, comparatively poorly filled in *Lasiobelonium*, and almost untraceable in *Trichopezizella*, enables to claim that *Trichopezizella* is the oldest and a more primitive genus and *Belonidium* is the youngest and a more progressive genus in this group. This idea is also supported by the analysis of the geographic distribution of these genera. *Trichopezizella* has its (residual) centre of diversity in the Pamiro-Alai Mountains and the Himalayas where 7 well-differentiated species, several of them with strikingly primitive features, occur. On the other hand, *Belonidium* has its centre of diversity in the Tien-Shan Mountains where 8 closely related species, several of them evidently neoendemic ones, can be found. So the law of homologous series gives a mycotaxonomist an opportunity to evaluate the phylogenetic relationships in an investigated group.

Another important aspect of the law of homologous series is its prognostic power. According to the latter the author prognosticated the existence of an undescribed species of *Belonidium* which was later discovered, indeed, and described under the name of *B. litorale* Raitv. Now I should like to show how the theoretical considerations arising from the law of homologous series have given me a useful lead to the reevaluation of taxonomy and nomenclature of the genus *Belonidium* which has served as the best model genus in my previous study on homologous series.

At first it should be reminded that the author (Raitviir, 1970) has interpreted the genus *Belonidium* Mont. et Dur. on the basis of a study by R. W. G. Dennis (1962), who treated it as a subgenus of *Dasyscyphus* S. F. Gray and claimed that *B. aeruginosum* Mont. et Dur., the type of the genus, is closely related to *Dasyscyphus elegantulus* (Karst.) Rehm, *D. mollissimus* (Lasch) Dennis, *D. sulphureus* (Pers.) Masseé, *D. triseptatus* Dennis, *D. corticalis* (Pers.: Fr.) Masseé, *D. fuscus* (Müller et Dennis) Dennis, *D. himalayensis* (Müller et Dennis) Dennis and *D. loniceræ* (Alb. et Schw.: Fr.) Dennis.

The author has treated *Belonidium* Mont. et Dur. as the genus of its own following R. W. G. Dennis' interpretation of its type species. Several additional species have been transferred into it and also a number of new ones have been described. *B. aeruginosum* Mont. et Dur. fits well its place in the white-haired series of the genus as a species with 3-septate spores (the Table) and it seems to be taxonomically and nomenclaturally a sound genus.

Recently, however, I have studied the type specimen of *Erinella andina* Pat. from FH. Earlier (Raitviir, 1970) I had this species classified as a member of *Albotricha* Raitv., following R. W. G. Dennis' (1954) redescription of the type specimen. I was surprised to find that *Erinella andina* Pat. was in fact a member of *Belonidium* Mont. et Dur. with white hairs and 3-septate spores.

Homologous series in the genus *Belonidium*

Spore characteristics	Hairs		
	colourless	yellow	brown
Very small, aseptate		<i>sacchalinense</i>	<i>meleagris</i>
Small, aseptate	<i>mollissimum</i>	<i>violascens</i>	<i>elegantulum</i>
Medium-sized, aseptate	<i>adenostylidis</i>	<i>leucophaeum</i>	<i>leucostomum</i>
Small, 2-celled			<i>remmii</i>
Medium-sized, 2-celled		<i>tianschanicum</i>	<i>graminophilum</i>
Large, 4-celled	<i>aeruginosum</i>	<i>sulphureum</i>	<i>litorale</i>
Very long, filiform	<i>vermitsporum</i>	<i>discolor</i>	

Now an important question arises: is it possible that there exist two white-haired species of *Belonidium* Mont. et Dur. having 3-septate spores with almost exactly overlapping measurements? As the species with 3-septate spores of *Belonidium* are rather primitive and comparatively rare and as they show no tendency to have closely related sibling species, then the theoretical considerations say that the answer to this question is evidently no.

Consequently I was forced to re-examine the type collection of *Belonidium aeruginosum* Mont. et Dur. to clear up its real taxonomic position. The study of the type material of *Belonidium aeruginosum* Mont. et Dur. from PC shows that this species is closely related to the species of *Lachnum* Retz with thick-walled hairs. It has ectal excipulum of "textura prismatica" and very thick-walled minutely punctate hairs. The roughness of the hairs could be easily overlooked or underestimated. In fact the structure of hair walls of *Belonidium aeruginosum* Mont. et Dur. resembles that of such foliicolous species as *Lachnum capitatum* (Peck) Raitv. and *L. lespedezae* (Raitv.) Raitv. The hairs of all the three species bear massive crystal caps which are almost sphaerical in *B. aeruginosum* Mont. et Dur.

If one looks more closely at the species of *Lachnum* Retz. with thick-walled hairs, it becomes evident that there is a series of species on *Rubus* stems which includes a species with 3-septate spores known as *Dasyscyphus scabrovillosus* (Phill.) Sacc. In the corresponding homologous series of species on fallen leaves no species with 3-septate spores has been found and now *Belonidium aeruginosum* Mont. et Dur. is just such a species — a homologue of *Dasyscyphus scabro-villosus* (Phill.) Sacc.

The results of this study show that taking into account the general regularities of species diversity within a genera as formulated by the law of homologous series gives a mycotaxonomist an opportunity to reevaluate and correct the existing classifications.

Now the name *Belonidium* Mont. et Dur. should be applied to the species of *Lachnum* with thick-walled hairs (Appendix I) and the species with smooth-walled hairs assigned to the genus *Belonidium* Mont. et Dur. by the author (Raitviir, 1970) need a new generic name. Fortunately the name *Trichopeziza* Fuckel is available for them (Appendix II).

Notes on the nomenclature and taxonomy of the genus  
*Lachnum* subgen. *Belonidium*

**Lachnum** Retz. Flor. Scand. Prodrum 256. (1779) subgen.  
**Belonidium** (Mont. et Dur.) Raitv. comb. nova.

Basionymum: *Belonidium* Mont. et Dur. Fl. Alger. tab. 28, fig. 8 (1846). Syn.: *Dasyscyphus* S. F. Gray Nat. Arrang. Brit. Fl. 1: 670 (1821) subgen. *Belonidium* (Mont. et Dur.) Dennis, Persoonia 2 (2): 181 (1962) (solum typus non species alia). *Dasyscyphus* S. F. Gray Nat. Arrang. Brit. Fl. 1: 670 (1821) subgen. *Capitotricha* Raitv., Scripta Mycologica 1: 88 (1970). *Brunnipila* Baral, Beihefte zur Zeitschrift für Mykologie 6: 49 (1985). *Capitotricha* (Raitv.) Baral, Beihefte zur Zeitschrift für Mykologie 6: 60 (1985).

Typus subgeneris: *Belonidium aeruginosum* Mont. et Dur. Fl. Alger. tab. 28, fig. 8 (1846).

The generic name *Belonidium* Mont. et Dur. has a very unfortunate history. The first misinterpretation of the genus by De Notaris has been described by R. W. G. Dennis (1962) but in the same paper its author himself has misinterpreted the important generic characters of the single foundation species of the genus. His interpretation has been followed by A. Raitviir (1970). The study of the type specimen of *B. aeruginosum* Mont. et Dur. has shown, as described above in this paper that the correct taxonomic position of *B. aeruginosum* Mont. et Dur. is, however, among the species of *Lachnum* Retz. with thick-walled hairs. Thus the name *Lachnum* subgen. *Belonidium* (Mont. et Dur.) Raitv. replaces *Dasyscyphus* subgen. *Capitotricha* Raitv.

I can see no taxonomic reason to raise this subgenus into generic rank; moreover, it should be extremely confusing nomenclaturally. It should be noted that H. O. Baral (Baral, Krieglsteiner, 1985) has made three generic splits from the genus *Lachnum* for the species with thick-walled hairs. In my opinion none of them is worth more than a rank of the section. Two of them fall automatically into synonymy of *Lachnum* subgen. *Belonidium* (Mont. et Dur.) Raitv. H. O. Baral's third genus *Incrucipulum* Baral is typified by *Peziza ciliaris* Schrad.: Fr. and includes *Lachnum capitatum* (Peck) Raitv., *Lachnum virtembergense* (Matheis) Raitv., etc. In my opinion *Lachnum ciliare* (Schrad.: Fr.) Rehm has no typical thick-walled hairs and is not closely related to the species listed. *L. ciliare* (Schrad.: Fr.) Rehm seems to be more closely related to *L. roseum* (Rehm) Rehm and other species with comparatively wide thin-walled 5-celled hairs tipped by scanty crystals. *Incrucipulum* Baral is available as a section name for these species of *Lachnum* Retz. subg. *Lachnum*.

*Lachnum* Retz. subgen. *Belonidium* (Mont. et Dur.) Raitv. could be divided into three sections. Their short diagnoses are given below, but as a detailed study of this group is in progress, no full list of species is given in the present paper.

**1. Sect. Belonidium.**

Apothecia shortly but distinctly stalked. Hairs hyaline, stiff, very thick-walled, bearing crystal caps. Ectal excipulum composed of large-celled textura prismatica; the cells have sometimes very thick gelatinized walls.

**2. Sect. Capitotricha (Raitv.) Raitv. comb. nova.**

Basionymum: *Dasyscyphus* S. F. Gray subgen. *Capitotricha* Raitv., Scripta Mycologica 1: 88 (1970).

Typus: *Lachnum bicolor* (Bull.: Fr.) Karst. Mycol. Fenn. 1: 172 (1871).

Apothecia shortly stipitate to subsessile. Hairs hyaline, thick-walled, slightly flexuous, very long, bearing crystal caps. Ectal excipulum of *textura prismatica*, cells comparatively long and narrow with slightly thickened walls.

**3. Sect. *Brunnipila* (Baral) Raitv. comb. nova.**

Basionym: *Brunnipila* Baral, Beihefte zur Zeitschrift für Mykologie 6: 49 (1984).

Apothecia distinctly stipitate, externally brown, hymenium pale greyish to pale ochraceous. Hairs brown, thick-walled, stiff, bearing caps of crystals. Ectal excipulum of hyaline *textura prismatica*.

Typus: *Lachnum clandestinum* (Bull.: Fr.) Karst. Mycol. Fenn. 1: 178 (1871).

## APPENDIX II

### Synopsis of the genus *Trichopeziza*

***Trichopeziza* Fuckel Symb. Myc. 295 (1869).**

Syn.: *Dyslachnum* Clements Gen. Fungi 87 (1909).

Typus generis: *Peziza sulphurea* Pers.: Fr. Syst. Myc. 2: 104 (1823).

Misapplied names: *Dasyscyphus* subgen. *Belonidium* (Mont. et Dur.) Dennis, Persoonia 2 (2): 181 (1962). *Belonidium* Mont. et Dur. Fl. Alger. tab. 28, fig. 8 (1846) emend. Raitv., Scripta Mycologica 1: 43 (1970).

Note: The history of the name *Trichopeziza* Fuckel and its typification were discussed in detail by R. W. G. Dennis (1962).

#### Included species

***Trichopeziza adenostylidis* (Rehm) Raitv. comb. nova.** Basionymum: *Lachnum adenostylidis* Rehm, Ann. Myc. 11: 392 (1913).

***Trichopeziza andina* (Pat.) Raitv. comb. nova.** Basionymum: *Erinella andina* Pat., Bull. Soc. Mycol. Fr. 9: 146 (1893).

***Trichopeziza atropurpurea* (Dur.) Raitv. comb. nova.** Basionymum: *Lachnum atropurpureum* Dur., J. Mycol. 10: 100 (1904).

***Trichopeziza discolor* (Mout.) Raitv. comb. nova.** Basionymum: *Erinella discolor* Mout., Compt. Rend. Bull. Soc. Bot. Belg. 36 (2): 20 (1897).

*Trichopeziza elegantula* (Karst.) Sacc. Syll. Fung. 8: 405 (1889).

*Trichopeziza eupatorii* (Schw.) Sacc. Syll. Fung. 8: 426 (1889).

***Trichopeziza graminophila* (Raitv.) Raitv. comb. nova.** Basionymum: *Belonidium graminophilum* Raitv., Scripta Mycologica 1: 47 (1970).

*Trichopeziza karstenii* Sacc. Syll. Fung. 8: 417 (1889). Syn.: *Peziza radians* Karst., Not. Sällsk. Fauna Fl. Fenn. 10: 200 (1869). Non *Trichopeziza radians* (Saut.) Sacc. Syll. Fung. 8: 429 (1889).

*Trichopeziza leucophaea* (Pers.) Rehm Ascom. No. 65 (1871).

*Trichopeziza leucostoma* (Rehm) Sacc. Syll. Fung. 8: 406 (1889).

***Trichopeziza litoralis* (Raitv.) Raitv. comb. nova.** Basionymum: *Belonidium litorale* Raitv., Fol. Crypt. Est. 13: 8 (1982).

***Trichopeziza meleagris* (Ell.) Raitv. comb. nova.** Basionymum: *Peziza (Dasyscypha) meleagris* Ell., Bull. Torrey Bot. Club. 8: 123 (1881).

*Trichopeziza mollissima* (Lasch) Fuck. Symb. Myc. 296 (1869).

***Trichopeziza remmii* (Raitv.) Raitv. comb. nova.** Basionymum: *Belonidium remmii* Raitv., Scripta Mycologica 1: 48 (1970).

***Trichopeziza sacchalinensis* (Raitv.) Raitv. comb. nova.** Basionymum: *Belonidium sacchalinense* Raitv., Fol. Crypt. Est. 9: 2 (1977).

*Trichopeziza sulphurea* (Pers.: Fr.) Fuck. Symb. Myc. 296 (1869).

***Trichopeziza tianschanica* (Raitv.) Raitv. comb. nova.** Basionymum: *Belonidium tianschanicum* Raitv., Fol. Crypt. Est. 12: 2 (1982).

*Trichopeziza varicolor* (Fr.) Raitv. comb. nova. Basionymum: *Peziza varicolor* Fr. Syst. Myc. 2: 100 (1823).

*Trichopeziza vermispора* (Raitv.) Raitv. comb. nova. Basionymum: *Dasyscyphus vermispорus* Raitv., Biol. Journ. Armenii 21 (8): 6 (1968).

*Trichopeziza violascens* (Raitv.) Raitv. comb. nova. Basionymum: *Belonidium violascens* Raitv., Scripta Mycologica 1: 46 (1970).

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#### MÄRKMEID PEREKONDADE BELONIDIUM, TRICHOPEZIZA JA LACHNUM (HYALOSCYPHACEAE) SÜSTEMAATIKA JA NOMENKLATUURI KOHTA HOMOLOOGILISTE RIDADE TEOORIA PÕHJAL

Artiklis on käsitletud mitmeid N. Vavilovi homoloogiliste ridade seaduse rakendamise aspekte liudseente süstemaatikas ning toodud näiteid, kuidas perekondade liigilise mitmekesisuse analüüsimine homoloogiliste ridade seadusest lähtudes võimaldab hinnata nende monofüleetilisust ja fülogeneetilist vanust. Homoloogiliste ridade seaduse rakendamine süstemaatikas võimaldab hinnata klassifikatsioonide õigsust ja anda juhiseid nende muutmiseks. Käesolevas uurimuses on oluliselt muudetud sugukonna *Hyaloscyphaceae* perekondade *Belonidium* ja *Trichopeziza* taksonoomiat ja nomenklatuuri.

Aйн РАЙТВИИР

#### ЗАМЕТКИ К СИСТЕМАТИКЕ И НОМЕНКЛАТУРЕ РОДОВ BELONIDIUM, TRICHOPEZIZA И LACHNUM (HYALOSCYPHACEAE) В СВЕТЕ ЗАКОНА ГОМОЛОГИЧЕСКИХ РЯДОВ

Рассматривается применение закона гомологических рядов Вавилова в систематике дискомицетов. Приводятся примеры о том, как анализ видового разнообразия родов на основе закона гомологических рядов позволяет оценить их монофилетичность и филогенетический возраст. Применение закона гомологических рядов позволяет оценить достоверность классификации и дать указания для их изменения. В настоящем исследовании введены существенные изменения в таксономию и номенклатуру родов *Belonidium* и *Trichopeziza* семейства гиалосцифовых грибов.