

Daugavpils Universitāte  
Dzīvības zinātņu un tehnoloģiju institūts  
Biodaudzveidības Departaments  
Koleopteroloģisko pētījumu centrs

**Anita Rukmane-Bārbale**

**ĢINTS *PACHYRHYNCHUS* GERMAR, 1824 (COLEOPTERA: CURCULIONIDAE:  
PACHYRHYNCHNI) FAUNA, SISTEMĀTIKA UN BIOĢEOGRĀFIJA  
ORIENTĀLAJĀ REĢIONĀ**

Promocijas darba kopsavilkums  
zinātnes doktora (*Ph. D.*) dabaszinātnēs grāda iegūšanai  
(bioloģijas nozares, zooloģijas apakšnozarē)

Darba zinātniskais vadītājs:  
Dr. biol., prof. Arvīds Barševskis

Daugavpils, 2023

Promocijas darbs tika izstrādāts Daugavpils Universitātes Koleopteroloģisko pētījumu centrā, laika posmā no 2014. līdz 2023. gadam.



IEGULDĪJUMS TAVĀ NĀKOTNĒ

Laika posmā no 02.2018. līdz 11.2018. promocijas darba izstrādē izmantots Daugavpils Universitātes pētniecības granta **“New methods on the study of the genus Pachyrhynchus Germar, 1824, including DNA barcoding, as a new leading strategy to eliminate species”** līdzfinansējums.

Laika posmā no 02.2019. līdz 11.2019. promocijas darba izstrādē izmantots Daugavpils Universitātes pētniecības granta **“Systematic research of the genus Pachyrhynchus Germar, 1824”** līdzfinansējums.

10. 2019 izmantots SYNTHESYS+ individuālais grants pieredzes apmaiņai Ungārijas Nacionālā dabas un vēstures muzeja kolekcijās. (Budapešta, Ungārija).

Pieredzes apmaiņa Drēzdenes, Parīzes, Londonas dabas muzejos, kā arī ekspedīcijas materiāla ievākšanai klātienē īstenotas pateicoties Erasmus+ finansējumam.

Darbs izstrādāts ar Eiropas Sociālā fonda atbalstu projektā “Daugavpils Universitātes stratēģiskās specializācijas jomu akadēmiskā personāla profesionālās kompetences stiprināšana 3. kārtā” vienošanās Nr. 8.2.2.0/20/I/003.

**Darba raksturs:** promocijas darbs (publikāciju kopa) bioloģijas nozares zooloģijas apakšnozarē.

**Darba zinātniskais vadītājs:** Dr. biol., prof. **Arvīds Barševskis**

#### **Recenzenti:**

1. Dr.hab.inž. Paweł Sienkiewicz (Poznaņas Dzīvības zinātņu universitāte);
2. Dr.biol., Prof., Artūrs Škute (Daugavpils Universitāte);
3. Dr.biol. Mārtiņš Kalniņš (AS “Latvijas valsts meži”)

**Promocijas padomes priekšsēdētājs:** Dr. biol., prof. Inese Kokina

**Darba aizstāvēšana notiks:** Daugavpils Universitātes Bioloģijas nozares promocijas padomes atklātā sēdē 2024. gada 16. Februārī, plkst. 13:00, Parādes ielā 1A, 130 auditorijā, kā arī tiešsaistē ZOOM platformā.

Ar promocijas darbu un tā kopsavilkumu var iepazīties Daugavpils Universitātes bibliotēkā, Parādes ielā 1, Daugavpilī (Latvija) un Daugavpils Universitātes interneta mājas lapā [www.du.lv](http://www.du.lv)

## SATURS

IEVADS.....	4
Pētījuma aktualitāte.....	4
Pētījuma novitāte, Darba hipotēze, aizstāvēšanai izvirzītās tēzes.....	5
Darba mērķis un uzdevumi.....	6
DARBA REZULTĀTU APROBĀCIJA.....	7
LITERATŪRAS APSKATS	
Ģints <i>Pachyrhynchus</i> Germar, 1824 faunas pētījumu vēsture.....	11
MATERIĀLS UN METODIKA	
Lauka pētījumu metodes.....	14
Laboratorijas pētījumu metodes.....	14
APSTRĀDĀTAIS MATERIĀLS.....	16
REZULTĀTI UN DISKUSIJA	
Pachyrhynchini tribas Orientālā reģiona faunas apskats.....	17
Pachyrhynchini Schoenherr, 1826, <i>Apocyrtidius</i> Heller, 1908, <i>Apocyrtus</i> Erichson, 1834, <i>Enoplocyrtus</i> Yoshitake, 2017.....	17
<i>Eumacrocyrtus</i> Schultzze, 1924, <i>Eupachyrrhynchus</i> Heller, 1912, <i>Exnothapocyrtus</i> Schultzze, 1924.....	18
<i>Expachyrhynchus</i> Yoshitake, 2013, <i>Homalocyrtus</i> Heller, 1912, <i>Macrocyrtus</i> Heller, 1912, <i>Metapocyrtus</i> Heller, 1912.....	19
<i>Nothapocyrtus</i> Heller, 1912, <i>Pantorhytes</i> Faust, 1892.....	20
<i>Proapocyrtus</i> Schultzze, 1918, <i>Pseudapocyrtus</i> Heller, 1912, <i>Sphenomorpha</i> Behrens, 1887, <i>Trichomacrocyrtus</i> Yoshitake, 2018.....	21
Ģints <i>Pachyrhynchus</i> Germar, 1824.....	22
<i>Pachyrhynchus</i> Germar, 1824 Orientālā reģiona zoogeogrāfija.....	22
<i>Pachyrhynchus</i> Germar, 1824 morfoloģisko pazīmju un ģenitāliju struktūru analīze.....	23
Pachyrhynchini tribas jaunatklātie taksoni.....	25
SECINĀJUMI.....	26
IZMANTOTĀ LITERATŪRA.....	28

## IEVADS

### PĒTĪJUMA AKTUALITĀTE

*Pachyrhynchus* Germar, 1824 ģints smecernieki (Curculionidae Latreille, 1802) pārstāv vienu no lielākajām vaboļu kārtas (Coleoptera), Pachyrhynchini tribas ģintīm Orientālajā reģionā. Lielākais īpatsvars sugu apdzīvo Filipīnu arhipelāga salas, mazāk – Taivānas un Indonēzijas salas. Orientālajā faunā Pachyrhynchini tribā zināmas 641 suga, 173 no kurām pārstāv *Pachyrhynchus* ģinti [2]. Ģints pārstāvji ir sastopami galvenokārt kalnainos tropu mežu biotopos, ar augstumu virs jūras līmeņa no 800m līdz 2400m. Taivānas salās mītošo sugu kāpuri attīstās koku saknēs, bet informācija par Filipīnu un Indonēzijas sugu kāpuru dzīvesveidu ir maz pētīta. Ģints pārstāvji ir atrasti gan uz vairāku vietējo, gan invazīvo augu lapām, taču nav zināma precīza informācija par īpatņu bioloģiju. Lai gan viena no visbiežāk sastopamajām *Metapocyrtus* Heller, 1912 ģints sugām *Metapocyrtus* (*Trachycyrtus*) *hederaephilus* Yoshitake, 2012 tiek uzskatīta par lauksaimniecības kaitēkli, *Pachyrhynchus* ģints īpatņi novēroti reti un pārāk nelielā skaitā, lai nodarot nebūtisku kaitējumu augu kultūrām. Straujā primāro mežu izciršana un aizstādīšana ar lauksaimniecības kultūrām Filipīnu arhipelāgā ir pamats tam, ka daudzi autori [8, 14, 16, 17] ir aktualizējuši jautājumu par ģints aizsardzības nepieciešamību. Sugas ir ne tikai endēmas, bet atsevišķos gadījumos var būt sastopamas tikai konkrēta kalna teritorijā, kā, piemēram, *P. apoensis* Yoshitake, 2012, kas sastopama tikai Apo kalnā. Pilnīga meža biomasas likvidācija šajā gadījumā nozīmētu arī potenciālu sugas izmiršanu. Papildus tam, ģints pārstāvji ir plaši pārstāvēti privātajās un dabas muzeju kolekcijās, tie ir populārs tirdzniecības objekts plaši pazīstamās interneta vietnēs, tādās kā ebay un amazon. Kolekcionāru ieinteresētība retāk sastopamos īpatņos veicina vācēju vēlmi nopelnīt un pārkāpt aizliegumu par īpatņu ievākšanu īpaši aizsargājamās teritorijās, līdz ar ko īpatņi tiek masveidā ievākti un kopējais populācijas skaits samazinās. Iepriekš minēto faktoru dēļ, īpaša nozīme ir sugas precīzai, savlaicīgai identifikācijai. Ir nepieciešams revidēt vietējās faunas smecernieku sastāvu, kas kalpotu kā izglītojošs materiāls vides aizsardzības, bioloģijas un lauksaimniecības nozaru speciālistiem, pasniedzējiem un studentiem, entomologiem, ekologiem, kā arī vietējiem iedzīvotājiem. Smecernieki ir katra sauszemes biotopa neatņemama sastāvdaļa, to daudzveidības zudumam var būt neatsveramas sekas.

*Pachyrhynchus* ģints vaboļu pētījumi ir kļuvuši par aktuālu tēmu pasaules entomologu vidū, sākot ar 2012. gadu ģints pētījumiem pievērsušies gan vietējie Filipīnu, gan ārzemju, tai skaitā Taivānas, Itālijas, Japānas un arī Latvijas pētnieki, kā rezultātā sugu skaits ģintī ir pieaudzis par 87, kas ir vairāk kā puse no sugu kopskaita. Nepietiekama informācija par Filipīnu arhipelāga smecerniekiem, augstā biodaudzveidība un apdraudētības risks bija noteicošie pētījumu objekta izvēles kritēriji. Vairumam ģints sugu pieejamie faunistiskie dati datējās ar 20. gadsimta sākumu un bija uzskatāmi par nepilnīgiem, kā arī ir pieaudzis jaunu ģeogrāfisko atradņu skaits, līdz ar ko nebija skaidra sugu aktuālā izplatība un sastopamība. Pastāvēja problēmas arī ar atsevišķu sugu taksonomisko statusu. Izmantojot mūsdienīgas pētījumu metodes, pētījuma laikā ievākts un apstrādāts plašs koleopteroloģiskais materiāls, izveidots mūsdienu sistemātiskai atbilstošs Orientālā reģiona sugu saraksts, kā arī atrisinātas daudzas taksonomiskās problēmas, kā rezultātā aprakstīti jauni taksoni.

## PĒTĪJUMA NOVITĀTE

Pētījuma laikā apkopota un izanalizēta visa pieejamā zinātniskā literatūra par Orientālā reģiona *Pachyrhynchini* tribas smecerniekiem, kas aptver bibliogrāfiskos avotus kopš 1821. gada. Darbā izmantoti oriģināli un iepriekš nepublicēti faunistiskie dati, apstrādāta Daugavpils Universitātes vaboļu kolekcija, kā arī deviņas ārzemju dabas muzeju kolekcijas, kas iekļauj lielu skaitu tipu materiāla. Pētījuma gaitā noskaidrots Orientālā reģiona *Pachyrhynchus* ģints faunas smecernieku sugu skaits un sastāvs. Orientālā reģiona faunā pašlaik konstatētas 173 *Pachyrhynchus* ģints sugas, lielākais īpatsvars sugu konstatēts jaunās atradnēs. Balstoties uz mūsdienīgiem priekšstatiem vaboļu sistemātikā, sastādīts un aprobēts Orientālā reģiona *Pachyrhynchus* ģints smecernieku anotētais, sistemātiskais katalogs, kurā norādīti sugu sinonīmi, bibliogrāfiskās atsauces, areāls un informācija, par holotipa atrašanās vietu. Pirmo reizi analizēti un precizēti faunistiskie dati, kas ievērojami paplašina priekšstatu par Orientālā reģiona faunas sugu daudzveidību, sastopamību un izplatību. Iegūtos datus būs iespējams izmantot aizsargājamo dabas teritoriju sugu sastāva precizēšanai. Izmantojot mūsdienīgas mikroskopijas metodes, tika izanalizētas un salīdzinātas sistemātiski tuvu taksonu morfoloģiskās īpašības un ģenitāliju uzbūve, tai skaitā *endophallus* forma un struktūras, kā arī to izmantošana sugu identifikācijā. Kopumā aprakstītas un publicētas 37 *Pachyrhynchus* ģints sugas un četras pasugas. Papildus *Pachyrhynchini* tribā aprakstītas četras *Eupachyrhynchus* sugas, divas *Trichomacrocyrthus* ģints sugas, trīs *Macrocyrthus* sugas, viena *Expachyrhynchus* suga, divas *Pseudapocyrthus* sugas un viena *Apocyrthus* suga. Pētījuma ietvaros izveidota *Pachyrhynchus* ģints standartkolekcija Daugavpils Universitātes vaboļu kolekcijā, kā arī turpinās darbs pie *Pachyrhynchini* tribas kolekcijas materiāla noteikšanas un papildināšanas *Metapocyrthus* ģints īpatņiem. Pārstāvēto sugu un eksemplāru skaita ziņā kolekcija ir viena no lielākajām pasaulē, ar ievērojamu tipu materiāla skaitu.

## DARBA HIPOTĒZE

Veicot Orientālā reģiona *Pachyrhynchus* ģints faunas, sistemātikas, bioģeogrāfijas, kā arī ārējo morfoloģisko un ģenitāliju struktūru izpēti, palielināsies sugu skaits, būs precizēts taksonomiskais statuss, sastopamība, izplatība un daudzveidība.

## AIZSTĀVĒŠANAI IZVIRZĪTĀS TĒZES

Pirmās ziņas par Orientālā reģiona *Pachyrhynchus* ģints faunu publicētas 1824. gadā, un kopš 2012. gada atsākušies intensīvi sistemātikas pētījumi. Ņemot vērā lielo materiāla daudzumu, kas konstatēts maz izpētītās Filipīnu arhipelāga provinēs, faunā vēl arvien var konstatēt zinātnei jaunas smecernieku sugas, bet lielākai daļai sugu var precizēt izplatību.

Pēdējo 10 gadu laikā sugu kopskaits ģintī palielinājies divkārtīgi, kā arī konstatēti vairāki sugu sinonīmi un daļa literatūrā norādīto sugu ir kļūdaini noteiktas, tādēļ ir jāpārskata Orientālā reģiona *Pachyrhynchus* ģints sugu saraksts.

Izmantojot mūsdienu mikroskopijas pētījumu metodes, iespējams atrisināt daudzu sistemātiski tuvu un grūti identificējamu smecernieku sugu noteikšanas problēmas, kā arī analizēt Orientālā reģiona *Pachyrhynchus* ģints sugu morfoloģiskās un ģenitāliju pazīmes, tai skaitā *endophallus* formu.

Veicot Orientālā reģiona *Pachyrhynchus* ģints sugu izplatības analīzi iespējams iegūt jaunas ziņas par sugu bioģeogrāfisko izplatību.

## DARBA MĒRĶIS UN UZDEVUMI

**Promocijas darba mērķis:** Veikt ģints *Pachyrhynchus* Germar, 1824 faunas, sistemātikas un bioģeogrāfijas izpēti Orientālajā reģionā, kā arī noskaidrot ģints taksonu noteikšanai būtiskas un praktiski izmantojamas pazīmes.

Darba mērķa sasniegšanai izvirzīti šādi uzdevumi:

- Apstrādāt DUBC pieejamo, kā arī pētījuma laikā iegūto materiālu, izveidojot *Pachyrhynchus* ģints smecernieku standart kolekciju. Apstrādāt lielāko vaboļu kolekciju materiālus;
- Noskaidrot ģints *Pachyrhynchus* faunas sastāvu un sastādīt sugu sistemātisko, anotēto katalogu;
- Noskaidrot un precizēt ģints *Pachyrhynchus* taksonu izplatību un sastopamību Orientālajā reģionā;
- Analizēt ārējo morfoloģisko pazīmju un ģenitāliju struktūras, tai skaitā *endophallus*, to izmantošanu taksonu identifikācijā;

## DARBA REZULTĀTU APROBĀCIJA

Promocijas darbs - publikāciju kopa, kas balstīta uz 27 publicētiem zinātniskiem rakstiem starptautiski recenzējamos žurnālos:

1. Rukmane A., Barševskis A. 2016. Nine new species of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae) from the Philippines. *Baltic Journal of Coleopterology*, 16(1): 77 - 96.
2. Rukmane A. 2016. Six new species of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae) from the Philippines. *Acta Biologica Universitatis Daugavpiliensis*, 16(1): 81 - 92.
3. Cabras A. A., Rukmane A. 2016. A new species of *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Entiminae). *Acta Biologica Universitatis Daugavpiliensis*, 16(1): 123 - 127.
4. Cabras A., Cortico F., Mohagan A. B., Rukmane A. 2017. Diversity of Pachyrhynchini (Coleoptera: Curculionidae: Entiminae) in Mt. Kiamo, Malaybalay, Bukidnon, Mindanao, Philippines. *Journal of Entomology and Zoology studies*, 5(3): 979 - 983.
5. Rukmane A. 2017. New species of the genus *Pachyrhynchus* Germar (Coleoptera, Curculionidae, Entiminae) from greater Mindanao Pleistocene Aggregate island complex (Philippines). *Acta Biologica Universitatis Daugavpiliensis*, 17(1): 85 - 95.
6. Bollino M., Sandel F., Rukmane A. 2017. New species of the genus *Pachyrhynchus* Germar, 1823 (Coleoptera: Curculionidae) from Mindanao, Philippines. *Baltic Journal of Coleopterology*, 17(2): 189 - 204.
7. Rukmane A., Cabras A. 2018a. New and additional notes on the distribution of *Pachyrhynchus mollendorffi* Heller, 1899 (Coleoptera, Curculionidae), with description of new taxon from the Marinduque Island (Philippines). *Baltic Journal of Coleopterology*, 18(2): 57 - 63.
8. Rukmane A., Cabras A. 2018b. Three new species of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae) from Panay Island, Philippines. *Baltic Journal of Coleopterology*, 18(1): 65 - 76.
9. Rukmane A. 2018a. An annotated checklist of genus *Pachyrhynchus* (Coleoptera: Curculionidae: Pachyrhynchini). *Acta Biologica Universitatis Daugavpiliensis*, 18(1): 63 - 68.
10. Rukmane A. 2018b. Checklist of *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) species of ZMUC (Natural History Museum of Denmark, University of Copenhagen). *Acta Biologica Universitatis Daugavpiliensis*, 18(2): 225 - 228.
11. Rukmane A. 2018c. To the knowledge of *Pachyrhynchus croesus* Oberthur, 1879 (Coleoptera: Curculionidae) species distribution and biogeography. *Acta Biologica Universitatis Daugavpiliensis*, 18(2): 229 - 232.
12. Rukmane A. 2018d. To the knowledge of *Pachyrhynchus moniliferus* Germar, 1824 (Coleoptera: Curculionidae) species distribution and biogeography with description of two new subspecies from Philippines. *Acta Biologica Universitatis Daugavpiliensis*, 18(2): 233 - 242.
13. Rukmane A. 2018e. One new species of genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) from Philippines. *Baltic Journal of Coleopterology*, 18(2): 193 - 198.
14. Rukmane A. 2018f. Two new species of genus *Pachyrhynchus* (Coleoptera: Curculionidae: Pachyrhynchini) from Mindanao, Philippines. *Baltic Journal of Coleopterology*, 18(2): 283 - 290.
15. Rukmane A. 2019a. To the knowledge of genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) species from SMNH (Stockholm, Sweden) with description

- of a new species from the Sibuyan Island (Philippines). *Baltic Journal of Coleopterology*, 19(1): 41 - 50.
16. Rukmane A. 2019b. To the knowledge on the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini), corrections and additions on the *Pachyrhynchus speciosus* species group. *Acta Biologica Universitatis Daugavpiliensis*, 19(2): 253 - 260.
  17. Rukmane A. 2019c. To the knowledge of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) species from HUF (Budapest, Hungary), with description of a new species from the Mindanao Island (Philippines). *Acta Biologica Universitatis Daugavpiliensis*, 19(2): 267 - 272.
  18. Rukmane A. 2019d. Four new species and two subspecies of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) from Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 19(2): 141 - 150.
  19. Bollino M., Rukmane A., Mohagan N. 2020. Two new *Pachyrhynchus* (Curculionidae: Entiminae: Pachyrhynchini) from Misamis Occidental (Mindanao, The Philippines). *Zootaxa*, 4852(3): 323 - 332.
  20. Rukmane-Bārbale A. 2020a. A new synonym of *Pachyrhynchus speciosus* Waterhouse, 1841 (Coleoptera: Curculionidae) from the Philippines. *Acta Biologica Universitatis Daugavpiliensis*, 20(1): 35 - 38.
  21. Rukmane-Bārbale A. 2020b. Short contribution to distribution and appearance of *Pachyrhynchus decussatus* Waterhouse, 1841 (Entiminae: Pachyrhynchini) with description of one new taxon from Catanduanes Island, Philippines. *Baltic Journal of Coleopterology*, 20(1): 81 - 85.
  22. Rukmane-Bārbale A. 2020c. To the knowledge of some closely related species of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) from Luzon Island (Philippines), with usage of eversion of endophallus. *Acta Biologica Universitatis Daugavpiliensis*, 20(2): 133 - 139.
  23. Rukmane-Bārbale A. 2020d. Two new species of the genus *Pachyrhynchus* Germar, 1824 (Curculionidae: Entiminae: Pachyrhynchini) from Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 20(2): 179 - 184.
  24. Rukmane-Bārbale A., Cabras A. A. 2021. Updated distribution of *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Entiminae) from the Philippines with biogeographic affinities. *Baltic Journal of Coleopterology*, 21(2): 199 - 211.
  25. Cabras A. A., Medina M. N. D., Torrejos C., Pajota E. L., Pepito M. J., Ceballos R., Rukmane A. 2022. Annotated list of Pachyrhynchini (Coleoptera, Curculionidae, Entiminae) in Davao City, Mindanao, Philippines. *CheckList*, 18(4): 799 - 814.
  26. Rukmane-Bārbale A. 2022. New species of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) from the Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 22(2): 433 - 436.
  27. Patano Jr. R. R., Amoroso V. B., Cortico F. P., Cleofe C. M. B., Rukmane-Bārbale A. 2022. *Pachyrhynchus cebrem* sp. nov.: A new species of easter egg weevil (Curculionidae: Entiminae: Pachyrhynchini) from Davao De Oro, the Philippines. *Philippine Journal of Systematic Biology*, 16(1): 50 - 53.

**9 zinātniskās publikācijas, kas publicētas Pachyrhynchini tribas ietvaros:**



1. Rukmane A. 2019. A new species of the genus *Expachyrhynchus* Yoshitake, 2013 (Coleoptera: Curculionidae: Pachyrhynchini) from Palawan Island, Philippines. *Baltic Journal of Coleopterology*, 19(1): 35 - 40.
2. Rukmane A. 2019. One new species of the genus *Macrocyrtus* Heller, 1912 (Coleoptera: Curculionidae: Pachyrhynchini) from Luzon Island, Philippines. *Acta Biologica Universitatis Daugavpiliensis*, 19(1): 37 - 40.
3. Rukmane A. 2019. Two new species of the genus *Macrocyrtus* subgenus *exmacrocyrtus* Schultzze, 1924 (Coleoptera: Curculionidae: Entiminae) from Luzon Island, Philippines. *Acta Biologica Universitatis Daugavpiliensis*, 19(2): 261 - 266.
4. Rukmane A. 2019. One new species of the genus *Trichomacrocyrtus* Yoshitake, 2018 (Coleoptera: Curculionidae: Entiminae) from Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 19(2): 159 - 162.
5. Rukmane A. 2019. Four new species of the genus *Eupachyrrhynchus* Heller, 1912 (Coleoptera: Curculionidae: Entiminae) from Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 19(2): 151 - 158.
6. Rukmane-Bārbale A. 2021. To the knowledge of the genus *Apocyrtus* Erichson, 1834 (Coleoptera: Curculionidae: Pachyrhynchini) with description of new species from Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 21(2): 181 - 188.
7. Rukmane-Bārbale A. 2021. Two new species of the genus *Pseudapocyrtus* Heller, 1912 (Coleoptera: Curculionidae: Pachyrhynchini) from Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 21(2): 189 - 198.
8. Rukmane-Bārbale A. 2022. A new species of the genus *Trichomacrocyrtus* Yoshitake, 2018 (Curculionidae: Entiminae: Pachyrhynchini) from Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 22(2): 437 - 441.
9. Rukmane-Bārbale A. 2022. A new species of the genus *Apocyrtus* Erichson, 1834 (Coleoptera: Curculionidae: Pachyrhynchini) from the Marinduque Island, Philippines. *Baltic Journal of Coleopterology*, 22(2): 429 - 432.

**Par promocijas darba galvenajiem rezultātiem sniegti ziņojumi 7 starptautiskajās zinātniskajās konferencēs:**

1. Rukmane A., Barševskis A. To the knowledge of *Pachyrhynchus orbifer* Waterhouse, 1841 (Coleoptera: Curculionidae) species fauna, distribution and biogeography. ИТОГИ И ПЕРСПЕКТИВЫ РАЗВИТИЯ ЭНТОМОЛОГИИ В ВОСТОЧНОЙ ЕВРОПЕ. Minsk, Belarus. 6 - 8. 09. 2017. Oral presentation.
2. Rukmane A., Barševskis A. The genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae) fauna, biogeography, mimicry and place in landscape protection. 9th international conference on biodiversity research. Daugavpils, Latvia. 26 - 28. 04. 2017. Poster.
3. Rukmane A. The place of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae) in landscape protection. Scientific International Conference Problems of Landscape Protection and Management in XXI century. Warsaw, Poland. 20 - 22. 04. 2017. Poster.
4. Rukmane A. DNA Barcoding as additional method for species description. Example on genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae). II Conference of Young Scientists. Warsaw, Poland. 25 - 26. 05. 2017. Oral presentation.
5. Rukmane A. New species of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) from the Greater Mindanao PAIC (Philippines). 10th international conference on biodiversity research. Daugavpils, Latvia. 24 - 26. 04. 2019. Poster.

6. Rukmane A. New and additional knowledge on the genus *Pachyrhynchus* Germar, 1824. 1st UM National Congress and 1st Scientific Meeting of the Philippine Coleopterological Network (PhilColNet). Davao, Philippines. 27 - 28. 04. 2019. Oral presentation.
7. Rukmane A. Diversity of the genus *Pachyrhynchus* Germar, 1824 in the Oriental region. 7<sup>th</sup> meeting of Baltic coleopterologists. Olszryn, Poland. 20 – 23. 06. 2023. Oral presentation.

## LITERATŪRAS APSKATS

### ĢINTS *PACHYRHYNCHUS* GERMAR, 1824 FAUNAS PĒTĪJUMU VĒSTURE

Nepilnu 200 gadu laikā *Pachyrhynchus* ģints smecernieku faunu ir pētījuši Vācijas, Anglijas, Austrijas, Japānas, Filipīnu, Latvijas un citu valstu entomologi, tomēr, vairumam pētījumu ir fragmentārs raksturs.

Pirmā *Pachyrhynchus* ģints suga publicēta 1824. gadā vācu entomologa Germara darbā [47]. Monogrāfijā minēta tikai viena *Pachyrhynchus* ģints suga *P. moniliferus* Germar, 1824. *Pachyrhynchus* ģints sistematizēta 1826. gadā pie jaunatklātās *Pachyrhynchini* tribas, ko aprakstījis vācu entomologs Šoenhers [80].

Franču entomologi Eidouks un Soulajets 1839. gadā [39] publicēja *P. chevrolati* aprakstu, sugai vēlāk tika mainīts taksonomiskais statuss: *P. moniliferus* ssp. *chevrolati*.

Angļu entomologs Vaterhaus 1841. gada monogrāfijā aprakstījis 18 sugas un vienu pasugu: *P. orbifer*, *P. phaleratus*, *P. decusatus*, *P. roseomaculatus*, *P. rugicollis*, *P. jugifer*, *P. reticulatus*, *P. speciosus*, *P. schoenherri*, *P. erichsoni*, *P. erichsoni* ssp. *eschsoltzi*, *P. venustus*, *P. multipunctatus*, *P. gemmatus*, *P. cumingi*, *P. perpulcher*, *P. latifasciatus*, *P. rufopunctatus*, *P. elefans*. Divas monogrāfijā iekļautās sugas atzītas par *P. moniliferus* Germar, 1824. sinonīmiem: =*P. concinnus*, =*P. chlorolineatus*, kā arī *P. roseomaculatus* sinonīms =*P. striatus*. Papildus tribas pētījumiem autors publicējis 1853. gada monogrāfijā [97, 98]. Entomoloģiskais materiāls iegūts no Kuminga ekspedīcijas uz Filipīnu arhipelāga salām. Kuminga ievāktos materiālus paralēli pētīja arī franču entomologs Ševrolats, kas tā paša gada ietvaros publicējis pētījumu rezultātus, vairums aprakstīto sugu klasificējami kā Vaterhausa aprakstīto sugu sinonīmi: *P. orbifer* Waterhouse, 1841 =*P. fimbriatus*, *P. glubulipennis*, *P. pretiosus*, *P. scintillans*, *P. alboguttatus*; *P. moniliferus* Germar, 1824 = *P. confinis*; *P. jugifer* Waterhouse, 1841 = *P. phodopterus*. Par valīdu atzīta viena pasuga: *P. orbifer* ssp. *gemmans*. Pētījumu turpinājumu Ševrolats publicēja 1879. gadā aprakstot *P. viridis*, kā arī 1881. gadā aprakstot divas sugas un vienu sinonīmu: *P. annulatus*; *P. lorquini*; *P. congestus* Pascoe, 1871 = *P. luteoguttatus* Chevrolat, 1881 [32, 33, 34].

Zviedru entomologs Šoenhers 1845. gadā publicēja *P. fahrei* aprakstu, kas vēlāk tika sinonimizēts kā *P. orbifer* Waterhouse, 1841. sinonīms [81].

Ģints pētījumiem pievērsās holandiešu entomologs Snellens van Vollenhovens 1864. gadā [91] publicējot pirmās *Pachyrhynchus* ģints sugas, kuras izplatītas ārpus Filipīnu arhipelāga, Indonēzijas salās: *P. morotaiensis* (Morotai), *P. forsteni* (Ternate, Halmaheira). Vēlāk, 1879. gadā, franču entomologs Oberthurs [72] aprakstīja *P. croesus* no Sanghir salas. Franču entomologs Feirmeirs 1897. gadā publicēja *P. infernalis* no Ishigahi-Sima salas [41]. Savukārt 1927. gadā japāņu entomologs Sakaguchi publicēja *P. niger* aprakstu, kas vēlāk atzīta par *P. infernalis* Fairmaire sinonīmu [78].

Angļu entomologs Pascoe 1871. gadā [74] publicēja četrus jaunu sugu aprakstus: *P. argus*, *P. congestus*, *P. inclytus*, *P. pinorum*. Visas sugas tika aprakstītas no Luzon salas.

Vācu entomologs Behrens 1887. gadā publicēja astoņu jaunu sugu aprakstus: *P. annulatus*, *P. dohrni*, *P. pulchellus*, *P. sarcitis*, *P. smaragdinus*, *P. venustus*, divas no sugām atzītas par sinonīmiem: *P. chlorites* Chevrolat, 1881 = *P. rutilans*; *P. inclytus* Pascoe, 1873 = *P. modestior* [3].

Vācu entomologs Krätz 1888. gadā publicēja trīs jaunu sugu un divu pasugu aprakstus. Visas aprakstītās sugas atzītas par sinonīmiem: *P. congestus* Pascoe, 1873 = *P. immarginatus*; *P. lorquini* Chevrolat, 1881 = *P. plavopunctatus*, = *P. flavomaculatus*. Jaunatklātās pasugas: *P. congestus* ssp. *caerulans*, *P. gemmatus* ssp. *purpureus* [63].

Vācu entomologs Fausts 1895. gadā publicēja divu jaunu sugu aprakstus, viena no aprakstītajām sugām atzīta par sinonīmu: *P. morotaiensis* Volh. 1864 = *P. waterhousei*; otrā: *P. gloriosus* Faust, 1895 [43].

Austriešu entomologs Hellers ir viens no atpazīstamākajiem Pachyrhynchini tribas pētniekiem. Autors aprakstījis sešas Pachyrhynchini tribas ģintis, vienu 1908 gadā: *Apocyrtidius* Heller, 1908; un piecas 1912. gada monogrāfijā: *Eupachyrrhynchus*, *Macrocyrtus*, *Metapocyrtus*, *Nothapocyrtus*, *Pseudapocyrtus*. *Pachyrhynchus* ģints pētījumu rezultātus autors pirmo reizi publicējis 1899 gadā, aprakstot *P. moellendorffi*. Par nozīmīgāko autora darbu uzskatāma 1912. gada monogrāfija, kurā autors papildus 14 sugām, divām pasugām un vienam sinonīmam publicējis arī ģints sadalījumu pa sugu grupām un publicējis pirmos datus par ģints bioloģiju. Autors 1912. gadā aprakstījis taksonus: *P. abranus*, *P. annelifer*, *P. circulatus*, *P. eques*, *P. lacunosus*, *P. moniliferus* ssp. *stellulifer*, *P. morio*, *P. nobilis*, *P. ochroplagiatus*, *P. pinorum* ssp. *transversalis*, *P. psittacinus*, *P. sanchezi*, *P. semperi*, *P. stellio*, *P. tristis*, *P. viridans*. *P. multipunctatus* Waterhouse, 1841 = *P. auroguttatus* Heller, 1912. Autors 1921. gadā publicēja trīs sugas un vienu pasugu, divas no sugām atzītas par sinonīmiem: *P. congestus* ssp. *pavonius*; *P. inclytus* Pascoe, 1873 = *P. modestior* var. *transversatus*; *P. lorquini* Chevrolat, 1881 = *P. bakeri*; *P. psittaculus*. 1923. gadā tika publicēts *P. basilanus* apraksts, kas bija pirmā un šobrīd vienīgā zināmā suga no Basilan salas. Autors 1929. gadā publicēja trīs sugu aprakstus: *P. cagayanus*, *P. disgestus*, *P. equester* [48, 49, 50, 51, 52, 53]. Kuntzens 1914. gadā publicējis *P. helleri*, kas veltīta augstāk minētajam autoram [64].

Darbu pie Taivānas salās izplatītajiem ģints pārstāvjiem veicis Taivāņu entomologs Kono, pirmo pētījumu publicējot 1929 gadā [61], aprakstot četras jaunas sugas: *P. insularis*, *P. yamianus* un *P. tobafolius*, *P. sarcitis*. 1936. gadā Kano publicējis apjomīgu biogeogrāfisko apskatu, ietverot pirmos ierakstus no Babuyan salām. Savukārt 1942 gadā [62] Kono aprakstījis ģinti *Kotoshozo*, kas atzīta par *Pachyrhynchus* ģints sinonīmu, pieskaitot *Kotoshozo kotoensis* sugu *Pachyrhynchus* ģintij, papildus aprakstīta *P. sonani* [60].

Apjomīgāko darbu pie ģints pētījumiem veicis vācu entomologs Šults. Autors 1916. gadā publicējis tribas katalogu, apkopojot visus literatūras avotus un zināmās sugu atradnes. Pirmos sugu aprakstus autors publicēja 1917. gadā, aprakstot piecas jaunas sugas no Luzon salas: *P. igorota*, *P. loheri*, *P. schultzei*, *P. sumptuosus*, *P. zebra*. 1919. gadā autors publicējis divu sugu aprakstus: *P. signatus*, *P. ardentius*; vienu pasugu: *P. venustus* ssp. *insulanus*; un divas sugas, kas atzītas par sinonīmiem: *P. speciosus* Waterhouse = *P. absurdus*, *P. venustus* Waterhouse = *P. virgatus*. Autors 1920. gadā publicējis *P. erosus* aprakstu, un 1922. gadā publicēti 17 jaunu sugu apraksti: *P. amabilis*, *P. apicatus*, *P. apocyrtoides*, *P. atrocyaneus*, *P. buccasanus*, *P. chamissoi*, *P. consobrinus*, *P. corpulentus*, *P. dubiosus*, *P. halconensis*, *P. pseudoproteus*, *P. postpubescens*, *P. regius*, *P. semiignitus*, *P. signaticollis*, *P. sulphureomaculatus*, *P. taylori*; divi pasugu apraksti: *P. gloriosus* ssp. *abbreviatus*, *P. orbifer* ssp. *azureus*. Pieci jaunu sugu apraksti publicēti 1923. gadā: *P. confusus*, *P. cruciatus*, *P. libucanus*, *P. samarensis*, *P. sphaericollaris*, publicēta arī līdz šim apjomīgākā monogrāfija, kas ietver ģints taksonomiju, izplatību un plašu bioloģijas aprakstu. Trīs jaunu sugu apraksti publicēti 1924. gadā: *P. baluganus*, *P. benguetanus*, *P. negrosensis*; un divu pasugu apraksti: *P. congestus* ssp. *ocellatus*, *P. taylori* ssp. *metalescens*. Jauni izplatības dati publicēti 1925. gadā, bet 1934. gadā autors publicēja trīs jaunu sugu aprakstus: *P. davaoensis*, *P. galeraensis*, *P. rizali*; un vienu pasugas aprakstu: *P. buccasanus* ssp. *ornatus* [82, 83, 84, 85, 86, 87, 88, 89, 90, 91].

Jauns pētījumu vilnis atsākās 2012. gadā, kad Japāņu entomologs H. Yoshitake publicēja deviņas jaunas *Pachyrhynchus* ģints sugas: *P. apoensis*, *P. caeruleovittatus*, *P. hirokii*, *P. naokii*, *P. pseudamabilis*, *P. sphenomorphoides*, *P. subamabilis*, *P. tadauchii*, *P. zamboanganus* [102]. Autors veicis apjomīgu darbu gan pie ģints, gan tribas pētījumiem [45, 46, 99, 100, 102, 122, 126, 127, 128], publicējis jaunus izplatības ierakstus un bioloģijas pētījumus [111, 112, 113, 116, 118, 119, 123, 124, 127], taču lielākais ieguldījums ir veikts tribas taksonomijā, atklājot trīs jaunas Pachyrhynchini ģintis [104, 109, 110] un

31 *Pachyrhynchus* ģints sugas [105]. Autors 2017. gadā publicējis desmit jaunu sugu aprakstus: *P. callainimaculatus*, *P. conformis*, *P. gilvomaculatus*, *P. niisatoi*, *P. notocruciatus*, *P. sakaii*, *P. septentrionalis*, *P. sumptuosoides*, *P. obhayashii* [106, 107, 108] viena no sugām publicēta kopā ar Filipīnu izcelsmes entomologi Yap: *P. masatoshii* Yoshitake & Yap [129]; četrus pasugu aprakstus: *P. orbifer* ssp. *striatamaculatus*, *P. orbifer* ssp. *callainus*, *P. congestus* ssp. *mirabilis*, *P. rukmanee* ssp. *paucisignatus*; viena no autora aprakstītajām sugām atzīta par sinonīmu: *P. rukmanee* Barševskis = *P. takakuwaii*. Viens pasugas apraksts publicēts 2018. gadā: *P. multipunctatus* ssp. *endoi* [113]. Deviņi jaunu sugu apraksti publicēti 2019. gadā: *P. atronitens*, *P. caeruleus*, *P. circummaculatus*, *P. florulentus*, *P. maruyama*, *P. naokae*, *P. noeli*, *P. yucae*, *P. yuukae*; viens pasugas apraksts: *P. phaleratus* ssp. *badiovittatus* [114, 115, 117, 120]; divas sugas publicētas sadarbībā ar Itāļu entomologiem: *P. octoannulatus*, *P. yoshitakeorum* Yoshitake, Bollino & Sandel [125], bet 2020. gadā publicēts viens jaunas sugas apraksts: *P. rochaorum* [121].

Ģints taksonomijas pētījumiem pievērsušies arī Itālijas entomologi Bollino un Sandel, pirmo pētījumu publicējot 2015. gadā, pētījumā ietverti trīs jaunu sugu apraksti: *P. mohagani*, *P. lubanganus*, *P. tilikinesis* [9]. Autori ir pirmie, kas sāka izmantot tēviņu dzimumorgāna iekšējā maisa piepūšanas metodi, lai atšķirtu līdzīgos taksonus. Lai gan vairums autoru darbu veltīti *Metapocyrtus* ģints taksonomijai, [6, 7, 10, 11, 12, 13, 79] autori lielu uzmanību pievērsuši arī *Pachyrhynchus* ģintij, ieviešot ģints sugu dalīšanu grupās ar kopīgu morfoloģisko pazīmju kopumu. Līdzīgu grupu dalīšanas metodi izmantoja arī Hellers un Šults. Vēlāk, 2017. gadā publicēti pirmo divu grupu apraksti un atklātas divas zinātnei jaunas sugas: *P. banglas*, *P. esperanza* Bollino, Sandel & Rukmane.

Taivānas entomologu grupa Tseng vadībā ir veikusi pētījumus pie Taivānas salu endēmo *Pachyrhynchus* ģints sugu bioloģijas un etoloģijas [30, 55, 56, 68, 69], kā arī publicējusi vienas jaunas sugas aprakstu: [31]. Pētnieki veikuši apjomīgu pētījumu Babuyan salu grupā dzīvojošo sugu bioloģijā [96, 101].

Vērtīgu ieguldījumu tribas pētījumiem devuši vietējie Filipīnu zinātnieki. Pētnieku grupa no Centrālās Mindanao Universitātes Mohagan vadībā pievērsušies gan *Metapocyrtus* ģints taksonomijai [75, 76, 77], gan *Pachyrhynchini* tribas bioloģijai un izplatības analīzei [70, 71].

Vienu no lielākajiem ieguldījumiem tribas bioloģijā, ekoloģijā un taksonomijā veikuši Mindanao Universitātes Koleopteroloģisko pētījumu centra pētnieki Medina un Kabras vadībā. Pētnieku grupa publicējusi 25 jaunu *Metapocyrtus* ģints sugu aprakstus [8, 15, 16, 17, 18, 19, 20, 21, 22, 24, 26, 27, 28, 29]. Divu *Pachyrhynchus* ģints sugu aprakstus: *P. miltoni* Cabras & Rukmane, *P. obumanuvu* Cabras & Medina [23]. Pievērsušies ģints evolūcijai [35, 36, 73], kā arī ekoloģijai un izplatībai [14, 25].

## MATERIĀLS UN METODIKA

### LAUKA PĒTĪJUMU METODES

#### 1. Vākšana ar entomoloģisko tīkliņu

Pateicoties ERASMUS+ sniegtajam finansējumam, 2018., 2019., 2020. un 2023. gada marta - maija mēnešos organizētas ekspedīcijas uz Filipīnu arhipelāga Mindanao salu, kur mērķgrupas indivīdi ievākti klātienē, to dabiskajā biotopā. Vākšana ar entomoloģisko tīkliņu ir pamat metode fitofāgo vaboļu ievākšanai. Mērķgrupas smecernieki neilgi pēc saullēkta kā arī pirms saulrieta uzturas uz lapu plātnēm vai rāpo pa koku stumbriem, savukārt dienas karstajā laikā slēpjas zem lapu plātnēm. To galvenā aizsarg reakcija ir krist zemē pie apdraudējuma konstatācijas. Izmantojot entomoloģisko tīkliņu iespējams gan noķert vaboli krišanas brīdī, gan sasniegt augstākos koku zarus. Izmantojot šo metodi, ievākts vairums materiāla.

#### 2. Vaboļu nopurināšana no koku vai krūmu zariem.

Konkrēto metodi iespējams izmantot krūmiem vai nelieliem kokiem. Zem auga novieto baltu audumu un koka/krūma zarus purina, līdz uz tiem esošie smecernieki nokrīt, un tos iespējams savākt ar rokām. Konkrētā metode ir efektīva fona sugu liela skaita ievākšanai, taču, pēc novērojumiem, retākas sugas biežāk uzturas augstu koku galotnēs, kur doto metodi nav iespējams pielietot.

#### 3. Biotopu vizuāla apskate.

##### 3.1. Augu vizuāla apskate.

Augus, uz kuriem potenciāli var uzturēties mērķgrupas smecernieki, vizuāli apskata uz vaboļu klātbūtni. No neliela attāluma apskata lapu plātnes no abām pusēm, koka/krūma stumbru. Augus, uz kuriem iepriekš konstatēti smecernieki, sistemātiski apskata ik pēc laika un potenciāli aktīvākajās dienas fāzēs: neilgi pēc saullēkta un īsi pirms saulrieta.

##### 3.2. Augsnes un zemsedzes vizuāla apskate.

Ņemot vērā smecernieku aizsargreakciju krist no lapām/stumbriem zemsedzē, pēc augu vizuālas apskates apskata arī tuvāko zemsedzi. Dotā metode būs efektīva kombinācijā ar entomoloģisko tīkliņu. Vaboles konstatē, pēc kā uzmanīgi ievāc, izmantojot entomoloģisko tīkliņu.

### LABORATORIJAS PĒTĪJUMU METODES

#### 1. Materiāla montēšana un uzglabāšana

Ekspedīciju ietvaros ievāktais, kā arī Daugavpils Universitātes Vaboļu kolekcijā esošais neapstrādātais materiāls samontēts atbilstoši entomoloģisko kolekciju noformēšanas prasībām. Smecernieku imago īpatņi atmērcēti verdošā ūdenī, nosusināti, izplāksņoti un ar PVA līmi pielīmēti uz atbilstoša izmēra kartona plāksnītēm, kuras uzdurtas uz atbilstoša biezuma entomoloģiskajām adatām. Vienāda līmeņa nodrošināšanai izmantots montēšanas bloks. Katram eksemplāram pievienota balta, četrstūra printēta etiķete ar ievākšanas vietas ģeogrāfisko nosaukumu, datumu un ievācēja uzvārdu. Tipu materiālam papildus pievienota sarkana, četrstūra printēta etiķete ar tipa statusu, latīnisko nosaukumu, autora un noteicēja uzvārdu.

## 2. Materiāla preparēšana

Visām pētījumā iekļautajām sugām preparētas ģenitālijas, kuru forma ir relatīvi nemainīga un vairumā gadījumu atšķirīga dažādu taksonu pārstāvjiem. Pētījuma gaitā analizēta gan tēviņu *aedeagus* gan mātīšu *spermatheca* forma. Problemātiski identificējamiem taksoniem veikta iekšējā maisa (*endophallus*) uzbūves izpēte. Pirms preparēšanas eksemplārs atmērcēts verdošā ūdenī, līdz tā audi kļūva mīksti.

Ģenitāliju preparēšanai izmantotas entomoloģiskās adatas ar izlocītu virsotni. Pirms *endophallus* uzpūšanas *aedeagus* vismaz stundu mērcēja 10% KOH šķīdumā. Atmērcētu *aedeagus* noskaloja ūdenī, lai atbrīvotos no KOH atliekām. *Aedeagus* pamatne uzsprausta uz atbilstoša izmēra šļirces, paramēra novilkta uz leju, apodēmas un *aedagus* ķermenis blīvi fiksēts pie šļirces ar parafilmas palīdzību, pēc kā uzpūsts, formas fiksēšanai izmantota zobu pasta, svaigiem īpatņiem iespējams izmantot ūdeni zobu pastas vietā. Veiksmīgas uzpūšanas gadījumā preparāts uzreiz fotografēts, lai izslēgtu formas maiņu, kas raksturīga vecākiem preparātiem.

## 3. Mikroskopiskie pētījumi un fotografēšana

Smecernieku morfoloģiskajiem pētījumiem izmantots digitālais stereo mikroskops Nikon SMZ 745T ar NIS Elements 6D 4.2. programmatūru (Canon). Fotoattēli uzņemti ar Canon EOS 6D digitālo kameru ar Canon MP-E 65mm makro objektīvu. Attēli uzņemti līmeņos ar stack shot automātisko augstuma regulēšanas sistēmu, konsekventi samontēti izmantojot Helicon Focus 8.2.7. programmatūru un apstrādāti ar Photoptea palīdzību.

## 4. Materiāla noteikšana

Sugu identifikācijai izmantoti sugu oriģinālie apraksti [3, 4, 9, 23, 32, 33, 34, 39, 40, 41, 42, 43, 47, 49, 50, 51, 53, 54, 62, 63, 64, 72, 74, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 96, 97, 98, 103, 106, 107, 108, 113, 114, 115, 117, 120, 121, 125, 129], kā arī apsekots tipu materiāls. Materiāla noteikšanā sniedza noderīgus padomus attiecīgās grupas speciālisti: Bollino, Sandel, Cabras.

## 5. Sistemātika

Taksonu sistemātika atbilstoši M. A. Alonso-Zarazaga & C. H. C. Lyal [2], Agassiz L. [1], Internacionālās Zooloģijas Nomenklatūras komisijas dokumentiem [58, 59];

Ģints un sugu katalogs sastādīts un publicēts apkopojot literatūras avotus dotā darba ietvaros. Papildus izmantoti citu autoru darbi [5, 44, 54, 57, 65, 66, 67, 93, 94].

## 6. Jaunatklāto taksonu aprakstīšana

Jaunatklātie taksoni pēc rūpīgas morfoloģiskās, ģenitāliju un atsevišķos gadījumos *endophallus* analīzes aprakstīti un publicēti dotā darba ietvaros. Izveidots sugas / pasugas morfoloģiskais apraksts, norādīts tipa materiāls, taksona izplatība, līdzība citām sugām un etimoloģija.

## 7. Izplatības analīze

Analizējot taksonu izplatības areālus, izmantoti dati no dažādiem literatūras avotiem [14, 25, 31, 37, 42, 43, 52, 55, 56, 61, 70, 71, 72, 78, 89, 96, 101, 106, 107, 111, 112, 118, 123]. Dati papildināti ar iegūto informāciju no entomoloģisko kolekciju apstrādes, kā arī ar datiem no ekspedīcijās ievāktā materiāla. Filipīnu arhipelāga biogeogrāfiskai analīzei izmantots valstī pieņemts reģionu un provinču sadalījums.

## **APSTRĀDĀTAIS MATERIĀLS**

Darba ietvaros veikta to vaboļu kolekciju analīze, kurās ir atrodams Orientālā reģiona Pachyrhynchini tribas smecernieku materiāls. Pētījuma ietvaros apstrādātas sekojošas kolekcijas:

DUBC - Daugavpils Universitātes vaboļu kolekcija, Daugavpils, Latvija

MTD - Drēzdenes dabas muzeja kolekcija, Drēzdene, Vācija

NHML - Londonas dabas un vēstures muzeja kolekcija, Londona, Lielbritānija

MNHN - Francijas Nacionālā dabas un vēstures muzeja kolekcija, Parīze, Francija

SMNH - Zviedrijas dabas un vēstures muzeja kolekcija, Stokholma, Zviedrija

HNHM - Ungārijas Nacionālā dabas un vēstures muzeja kolekcijas, Budapešta, Ungārija

NHMD - Dānijas dabas un vēstures muzeja kolekcija, Kopenhāgena, Dānija

NHMB - Berlīnes dabas un vēstures muzeja kolekcija, Berlīne, Vācija

NMP – Čehijas nacionālais dabas un vēstures muzejs, Prāga, Čehija

MMBC – Morāvijas dabas un vēstures muzejs, Brno, Čehija



## REZULTĀTI UN DISKUSIJA

### PACHYRHYNCHINI TRIBAS ORIENTĀLĀ REĢIONA FAUNAS APSKATS

#### **Pachyrhynchini Schoenherr, 1826**

= *Somatoides*: Schoenherr, 1823-1139; = *Pachyrhynchides* Schoenherr, 1826-88; = *Pachyrhynchoidea* Agassiz, 1846-270; = *Pachyrhynchini* Chevrolat, 1847-389; = *Pachyrhynchitae* Blanchard, 1853-201; = *Pachyrhynchidae* Waterhouse, 1853-201; = *Pachyrhynchini* Stein, 1868-100; = *Pachyrhynchidae* Behrens, 1887-212; = *Pachyrhynchinae* Faust, 1892-193; = *Pachyrhynchini* Heyne and Taschenberg, 1907-225; = *Pachyrhynchinae* Heller, 1922-542; = *Pachyrhynchoidea* Ienistea, 1986-32

Pachyrhynchini ir sugām plaši pārstāvēta smecernieku triba Orientālā reģiona faunā. Pasaulē zināma 641 suga, kas ir apvienotas 17 ģintīs.

Taustekļi izliekti, ģenikulēti, sastāv no 11 segmentiem; taustekļu pirmais posms laterāls, izliekts uz leju; biezums, izejas garums attiecībā pret acs perifēro vai distālo malu ir svarīga ģints pazīme: izeja līdz acs perifērajai malai / nenasiedz acs distālo malu / sasniedz acs distālo malu / pārsniedz acs distālo malu.

Pieaugušiem īpatņiem apakšžokļi bez rievām vai izciļņiem uz ārējās virsmas, vienmērīgi, lokveidā izliekti; segspārnu pamata stūri noapaļoti; pakaļ-gurni vienmērīgi līdz ar segspārnu malu.

#### ***Apocyrtdius* Heller, 1908-128**

Ģints pārstāvēta ar 1 sugu: *Apocyrtdius chlorophanus* Heller, 1908 un ir vienīgā Pachyrhynchini tribas suga, kas izplatīta Borneo. Pēdējās zināmās sugas atradnes reģistrētas Mesilau reģionā.

Ģints īpatņiem raksturīgs saīsināts taustekļu pirmais posms, kas nenasiedz acs iekšējo malu, taustekļi biezi, acis izteikti globulāras, spēcīgi izliektas ārpus galvas kontūras. Episternālā šuve izteikta. Segspārnu pamatnes devītais segments rievots. Apakšstilbu iekšmala nav saplacināta.

#### ***Apocyrthus* Erichson, 1834-252**

= *Apocryptus* Chevrolat, 1841-226

Ģints pārstāvēta ar 4 sugām, kas izplatītas četrās Filipīnu arhipelāga salās. Luzona salā: *A. mcgregori* Schultze, 1924, Negros salā: *A. chapmani* Schultze, 1934. Marinduque salā: *A. auroraensis* Rukman-Bārbale, 2021. Pamatojoties uz kolekciju datiem, *A. inflatus* Erichson, 1834, kas oriģināli izplatīta Luzona salā, izplatība papildināta ar jaunām atradnēm no Marinduque un Pollilo salām.

Ģints īpatņiem smeceris dorsāli ar dziļu, taisnu šķērsrievu, kas atdala smecera pamatni no galvas. Acis lielas, vidēji spēcīgi izspiestas ārpus galvas kontūras. Taustekļi biezi, pirmais posms sasniedz acs distālo malu. Segspārnu vairodziņš pilnībā nosegts. Segspārnu pamatnes I un II segmenti saauguši. Segspārni un priekškrūšu vairogas spēcīgi noapaļoti. Jaunatklātā suga no pārējiem ģints pārstāvjiem atšķiras ar spēcīgi noapaļotiem segspārniem abos dzimumos, kas klāti ar zaļiem zvīņu plankumiem. Segspārnu struktūra spēcīgi grumbuļaina, ar izteiktu rievojumu.

#### ***Enoplocyrthus* Yoshitake, 2017**

Ģints pārstāvēta ar vienu sugu *E. marusan* Yoshitake, 2017 kas izplatīta Luzona salā.

Raksturojošās pazīmes: smeceris dorsāli bez šķērsrievas, taisns, sānu malās pie taustekļu izejas trīsstūrveida formas ieliekums; priekškāju apakšstilbi saplacināti, ar ķīļveida izaugumu gar ārējo malu, pakaļkāju apakšstilbi bez izaugumiem gar iekšmalu; acis nelielas, nav izspiestas ārpus galvas kontūras.

### ***Eumacrocyrtus* Schultze, 1924-599**

Ģints pārstāvēta ar vienu sugu *E. canlaonensis* Schultze, 1923, kas izplatīta Filipīnu arhipelāga Negros salā.

Ģints īpatņiem raksturīgs vizuāli saplacināts ķermenis, ar izteikti vājāk dorsāli izliektiem segspārniem un priekškrūšu vairogu. Segspārni lancetveida formas, ar spēcīgi izvirzītu virsotni abiem dzimumiem. Priekškrūšu vairogs dorso-laterālajās daļās ar iespaidumiem. Taustekļi plāni, sasniedz acs distālo malu. Smeceris bez izteiktām šķērsrievām vai garenrievām, dorsāli ar seklu iespaidumu vidusdaļā. Acis nelielas, vāji izliektas ārpus galvas kontūras.

### ***Eupachyrrhynchus* Heller, 1912-324**

Ģints pārstāvēta ar septiņām sugām, četras no kurām aprakstītas promocijas darba ietvaros. Ģints izplatīta Luzona un Marinduque salās.

Raksturojošās pazīmes: smeceris dorsāli izliekts apikālajā daļā, ar ieliekumu bazālajā daļā, ar izteiktu mediālo garenrievu, bez dziļas šķērsrievas. Taustekļi plāni, sasniedz vai gandrīz sasniedz acs distālo malu. Segspārni spēcīgi izliekti dorsālajā skatā, saplacināti laterālajā skatā. Apakšstilbi ar nelieliem izaugumiem uz iekšmalas. Acis nelielas, nav izliektas ārpus galvas kontūras.

*E. auromaculatus* Rukmane-Bārbale, 2020 atšķirama ar maza izmēra, violetas krāsas ķermeni, segspārni un priekškrūšu vairogs klāti ar zelta krāsas plankumiem; segspārniem izteikta kvadrātveida forma. *E. barsevskisi* Rukmane-Bārbale, 2020 atšķiras ar masīvu, zelta krāsas ķermeni bez plankumiem. Segspārni spēcīgi noapaļoti, laterālā skatā saplacināti, priekškrūšu vairogs paplašināts pirms viduslīnijas, noapaļots. *E. barbalsi* Rukmane-Bārbale, 2020 atšķirama ar īsiem, noapaļotiem segspārniem, kas klāti ar ziliem plankumiem, ķermenis melns, priekškrūšu vairogs paplašināts pie pamatnes. *E. viridimaculatus* Rukmane-Bārbale, 2020 atšķirama ar īsiem, spēcīgi noapaļotiem segspārniem, kas klāti ar zaļiem plankumiem; ķermenis vara krāsas; priekškrūšu vairogs noapaļots, pamatne nav paplašināta, laterālajā skatā segspārni nav saplacināti.

### ***Exnothapocyrtus* Schultze, 1924**

Ģints pārstāvēta ar piecām sugām, visas izplatītas Filipīnu arhipelāga Luzon salā: *E. cylindricollis* Heller, 1912 (= *Nothapocyrtus cylindricollis* Heller; = *Nothapocyrtus chloropunctatus* Heller), *E. alboplagiatus* Heller, 1916 (= *Nothapocyrtus alboplagiatus* Heller), *E. erytomerus* Heller, 1912 (= *Nothapocyrtus erytomerus* Heller), *E. luzonicus* Schultze, 1917 (= *Nothapocyrtus luzonicus* Schultze), *E. basifasciatus* Heller, 1912 (= *Nothapocyrtus basifasciatus* Heller).

Raksturojošās pazīmes: smeceris dorsāli bez izliekuma apikālajā daļā, ar platu, seklu ieliekumu bazālajā daļā, ar mērenu mediālo garenrievu; starp smecera pamatni un galvu iespaidums, kurš sānos pāriet rievā līdz acu distālajai malai; taustekļi plāni, pirmais posms pārsniedz acs distālo malu; acis mazas, neizspiežas ārpus galvas kontūras; priekškrūšu vairogs cilindrisks, pamatne paplašināta; segspārni laterāli saplacināti, katrs segspārnis ar trīsstūrveida iespaidumu pie virsotnes.

### ***Expachyrhynchus* Yoshitake, 2013**

Ģints pārstāvēta ar trīs sugām, kuras izplatītas Filipīnu arhipelāga Palawan salā: *E. chloromaculatus* Yoshitake, 2013, *E. granulatus* Yoshitake, 2013, *E. palawanensis* Rukmane, 2019.

Raksturojošās pazīmes: smeceris dorsāli izliekts apikālajā daļā, izteikta šķērsrieva, kas atdala smeceri no galvas pamatnes, izteikta centrālā garenrieva; taustekļi biezi, nerasniedz acs distālo malu; acis vidēja izmēra, izspiestas ārpus galvas kontūras; segspārniem un priekškrūšu vairogam raksturīga spēcīgi rievota, nelīdzena struktūra, segspārni laterāli saplacināti, dorsāli vāji izliekti. *E. palawanensis* Rukmane, 2019 no citām ģints sugām atšķiras ar noapaļotu priekškrūšu vairoga un segspārnu formu, spēcīgi izspiestām acīm un marķējumu uz priekškrūšu vairoga: atsevišķas, vienlaidus izklidētas zaļas krāsas zvīņas.

### ***Homalocyrtus* Heller, 1912**

Ģints pārstāvēta ar sešām sugām, ar vairumu sugu no Luzon salas: *H. harapago* Heller, 1912, *H. intermittens* Heller, 1912, *H. tumidosus* Heller, 1912; vienu sugu no Leyte salas: *H. maculatus* Schultze, 1922 un vienu no Bohol salas: *H. subcuneiformis* Waterhouse, 1842 (= *Apocyrtus subcuneiformis*); *H. conicus* Boheman, 1845 nav zināma precīza izplatīb aizņemot Filipīnu arhipelāgu.

Raksturojošās pazīmes: Smecera dorsolaterālās malas noapaļotas; segspārni ovālas formas, spēcīgi paplašināti apikālajā daļā, ar platāko punktu aiz vidusdaļas; segspārni ar intensīvu apmatojumu gar segspārnu šuvi virsotnes virzienā.

### ***Macrocyrtus* Heller, 1912**

Ģints iedalīta divās apakšģintīs: *Exmacrocyrtus* Schultze, 1924-365 kas pārstāvēta ar sešamsugām: *M. (E.) erosus* Pascoe, 1871, *M. (E.) ilocanus* Schultze, 1918, *M. (E.) negrito* Heller, 1912, *M. (E.) pseudopolitus* Heller, 1921, *M. (E.) caeruleus* Rukmane, 2019, *M. (E.) fulgidus* Rukmane, 2019 un *Macrocyrtus* Heller, 1912 kas pārstāvēta ar deviņām sugām: *M. (M.) babuyanensis* Genka & Yoshitake, 2019, *M. (M.) benguatanus* Schultze, 1917, *M. (M.) castaenus* Pascoe, 1881, *M. (M.) contractus* Chevrolat, 1881, *M. (M.) montanus* Schultze, 1917, *M. (M.) splendidus* Genka & Yoshitake, 2019, *M. (M.) trilineatus* Schultze, 1918, *M. (M.) helleri* Janczyk, 1956, *M. (M.) stellarum* Rukmane, 2019. Visas sugas izplatītas Luzon salā.

Raksturojošās pazīmes: taustekļi plāni, sasniedz pāri acs distālajam galam; acis nelielas, maz vai nav izliektas ārpus galvas kontūras; smeceris bez dorsālās šķērsrievas, kas atdala smecera pamatni no galvas; pakaļkāju apakšstilbi ar lieliem, atsevišķi izvietotiem hitīna izaugumiem.

*Exmacrocyrtus* Schultze: segspārnu forma ovāla vai elipsveida, sānu skatā spēcīgi izliekta, ar iespiedumiem pie virsotnes.

*Macrocyrtus*: segspārni sānu skatā saplacināti.

Jaunatklātie taksoni galvenokārt atšķirami ar unikālo plankumu marķējumu uz priekškrūšu vairoga un segspārniem, kā arī analizētas atšķirības tēviņu dzimumorgānos.

### ***Metapocyrtus* Heller, 1912-337**

Visplašāk pārstāvētā Pachyrhynchini tribas ģints, ar sugu kopskaitu 308. Ģints sadalīta septiņās apakšģintīs: *Artapocyrtus* Heller, 1912 (32 taksoni), *Dolichocephalocyrtus* Schultze, 1925 (27 taksoni), *Metapocyrtus* Heller, 1912 (95 taksoni), *Orthocyrtus* Heller, 1912 (48 taksoni), *Sclerocyrtus* Heller, 1912 (4 sugas), *Sphenomorphaidea* Heller, 1912 (14 taksoni), *Trachycyrtus* Heller, 1912 (58 taksoni) un papildus 20 taksoni, kuri netiek iedalīti nevienā no apakšģintīm.

Smeceris garāks nekā plats, izņemot *Artapocyrtus* apakšģinti (garums un platums vienādi); smecera pamatne ar izteiktu šķērsrievu, kas atdala smeceri no galvas; taustekļu izeja pie vai smecera virsotnē; mediāla garenrieva un variējošas formas iespiedums uz pieres; acis mēreni izspiestas, nelielas; taustekļi plāni, segmentu garums variē, pirmais taustekļu segments sasniedz vai gandrīz sasniedz acs distālo malu; priekškrūšu vairogs punktots, izņemot atsevišķas *Orthocyrtus* sugas ar gludu priekškrūšu vairoga struktūru.

*Artapocyrtus* Heller: smeceris kvadrātveida vai trapecveida formas, garums un platums vienādi.

*Dolichocephalocyrtus* Schultze: smeceris garš un šaurs, bazālā daļa dorsāli ar kuprveida izliekumu, šķērsrieva sasniedz acs apakšējo malu, smecera sānos pie vaigiem trīsstūrveida ieliekums.

*Metapocyrtus* Heller: smeceris ar noapaļotām dorso-laterālajām malām; segspārni eleptiskas vai ovālas formas; priekškrūšu vairoga anteriorā mala rievota, intensīvi punktota.

*Orthocyrtus* Heller: smeceris ar smailām dorso-laterālajām malām; augšējā kontūrā smeceris taisns, ar sānu ieliekumiem gar šķērsrievu.

*Sclerocyrtus* Heller: smecera dorsolaterālā mala asa; priekškrūšu vairogs punktots; bez augšējās rievās un priekškrūšu vairoga; segspārni punktoti punktu līnijās, kas veido intervālus.

*Sphenomorphaidea* Heller: galva starp acīm izliekta, izteikti punktota; šķērsrieva līdz ar acs malu vai pagarināta; segspārni spēcīgi punktoti visa garumā.

*Trachycyrtus* Heller: Gan priekškrūšu vairogs gan segspārni spēcīgi punktoti.

No 308 sugām, 139 izplatītas Luzona salā, 78 Mindanao, 61 Visayas, bet 7 sugām izplatība nav precizēta (Filipīnu arhipelāgs). Septiņas sugas izplatītas ārpus Filipīnu arhipelāga.

*Metapocyrtus* ģintī atrodams vislielākais mimikrijas piemēru skaits, kur, lielākai daļai *Pachyrhynchus* ģints sugu atrodama viena vai vairākas *Metapocyrtus* ģints mimikrijas. Materiāla ievākšanas laikā konstatēts, ka *Metapocyrtus* ģints īpatņi ir sastopami daudz biežāk un lielākā skaitā par radniecīgās *Pachyrhynchus* ģints īpatņiem.

***Nothapocyrtus* Heller, 1912-334**

Ģints pārstāvēta ar vienu sugu no Luzona salas: *N. translucidus* Heller, 1912.

Smeceris garāks nekā plats, ar platu, seklu garenvirziena rievu-iespiedumu, kas sasniedz pieres vidusdaļu; acis lielas, izvirzītas ārpus galvas kontūras; taustekļu pirmais posms sasniedz priekškrūšu vairoga priekšējo malu; segspārni saplacināti, dorsāli spēcīgi izliekti, sašaurināti pie virsotnes.

***Pantorhytes* Faust, 1892-193**

= *Pantorrhytes* Heller, 1935-157

Ģints pārstāvēta ar 77 sugām, kas izplatītas Papua Jaungvinejā un Zālamanu salās.

Ģints īpatņi atšķirami galvenokārt ar sarkaniem, apaļas formas izaugumiem uz segspārniem, kas raksturīgi vairumam sugu ar atsevišķiem izņēmumiem; ķermenis un ekstermitātes klātas ar īsiem, baltiem matiem; priekškrūšu vairogs spēcīgi grumbuļains; smeceris īss, plats, raksturīga šķērsrieva un garenrieva, ieliekts bazālajā daļā, vēl viens ieliekums pie mutes; taustekļi biezi, nerasniedz acs distālo malu.

### ***Proapocyrtus* Schultze, 1918**

Ģints pārstāvēta ar divām sugām, vienu no Luzon salas: *P. luzonicus* Schultze, 1934 un vienu no Visayas salu grupas: *P. insularis* Schultze, 1918.

Raksturojošās pazīmes: Smeceris ar izteiktu mediālo garenrievu līdz pieres vidusdaļai un šķērsrievu pie acu pamatnes; pirmais un otrais taustekļu segmenti vienāda garuma; priekškrūšu vairogs dorsāli saplacināts, ar šķērsrievām abos galos; segspārni dorsāli saplacināti, laterāli izliekti asā leņķī, ar trīsstūrveida ieliekumu uz katra segspārņa pie virsotnes; segspārņu virsotnes nav savienotas.

### ***Pseudapocyrtus* Heller, 1912-326**

Ģints pārstāvēta ar 12 sugām: *P. exsectus* Heller, 1912, *P. productus* Heller, 1912 (Filipīnas); *P. formicarius* Heller, 1912, *P. imitator* Heller, 1912, *P. schandenbergi* Heller, 1912, *P. multipunctatus* Schultze, 1918, *P. apicatus* Schultze, 1922, *P. multianulatus* Heller, 1929, *P. legoskyi* Link & Zettel, 2012, *P. madelaensis* Rukmane-Bārbale, 2021, *P. robertsstasinskisi* Rukmane-Bārbale, 2021 (Luzon); *P. catanduanensis* Schultze, 1922 (Catanduanes).

Raksturojošās pazīmes: smeceris dorsāli izliekts, ar šķērsrievu kas atdala smecera pamatni no pieres; mediāla garenrieva uz pieres visa garumā; acis mazas, vāji vai nav izvirzītas ārpus galvas kontūras; taustekļi plāni, pirmais posms sasniedz acs iekšmalu. Promocijas darba ietvaros apbēvēta *P. madelaensis* atšķiras ar spēcīgi izvirzītiem segspārniem, kas izliekti, un no sānu skata veido ventrālu ieliekumu. Jaunatklātā *P. robertsstasinskisi* atšķiras ar pilnīgi melnu ķermeni bez krāsainu zvīņu marķējuma un lielākām acīm, kas spēcīgāk izvirzītas ārpus galvas kontūras; segspārņu virsotne tēviņiem izteikti kvadrātveida formas.

### ***Sphenomorpha* Behrens, 1887-339**

Ģints pārstāvēta ar 18 sugām, kuras izplatītas vairākās Indonēzijas salās. Ģints pārstāvjiem raksturīgs spēcīgi noapaļots priekškrūšu vairogs; segspārni laterāli saplacināti; ķermenis ar spēcīgu, metālisku spīdumu; acis lielas, spēcīgi izvirzītas ārpus galvas kontūras; smeceris paplašināts mutes virzienā, apikāli ar izliekumu, ieliekums pie bāzes pirms pieres; taustekļi plāni, pārsniedz acs distālo malu.

### ***Trichomacrocyrtus* Yoshitake, 2018**

Ģints pārstāvēta ar septiņām sugām, kas izplatītas Luzona salā: *T. calostigma* Yoshitake, 2018, *T. chlorostigma* Yoshitake, 2018, *T. hieroglyphicus* Schultze, 1917, *T. kalinganus* Schultze, 1922, *T. trivittatus* Schultze, 1922, *T. caerulans* Rukmane, 2019, *T. nubes* Rukmane-Bārbale, 2022.

Raksturojošās pazīmes: pakaļkāju apakšstilbu iekšmala biezi noklāta ar gariem, zelta krāsas matiem; smeceris bez šķērsrievas starp pamatni un galvu; pēdu I un II posmi plati. Promocijas darba ietvaros

aprobētā *T. caerulans* atšķirama ar zilo zvīņu marķējumu uz priekškrūšu vairoga un segspārniem un lielajām, spēcīgi izvīrītajām acīm, detalizētākai pārbaudei salīdzināta tēviņu dzimumorgānu forma.

## ĢINTS *PACHYRHYNCHUS* GERMAR, 1824

= *Sphaerogaster* Dejean, 1821-95; = *Somatodes* Schoenherr, 1823-1139; = *Sphaerogaster* Letreille, 1825-391; = *Sphaerogaster* Sturm, 1826-197; = *Sphaerogaster* Berthold, 1827-386; = *Pachirhinus* Latreille, 1828-596; = *Pochyrhynchus* Laporte, 1840-301; = *Pachyrhynchus* Desmarest, 1842-313; = *Pachyrhynchus* Desmarest, 1842-313; = *Pachyrhynchus* Gemminger and Harold, 1871-2243

## *PACHYRHYNCHUS* GERMAR, 1824 ORIENTĀLĀ REĢIONA ZOOĢEOGRĀFIJA

Pēdējie apkopotie ģints sugu izplatības dati publicēti 1923. gadā, Schultze monogrāfijā. Apkopojumā ir iekļautas 85 sugas un 13 pasugas. Kopš 2012. gada ģints sugu kopskaits ir ievērojami pieaudzis, īpaši, mazāk pētītās salās tādās kā Samar, Leyte un Mindanao sala. Lielākais sugu skaita pieaugums konstatēts Mindanao salā, kur no 14 sugām tagad zināmas 51 (37 jaunatklāti taksoni), to var skaidrot ar jaunām sugu atradnēm no Mt. Apo Dabas parka un Bukidnon augstienēm. Plašāk izpētīti arī salas rietumi - Zamboanga kalnu reģions. Luzona salā sugu kopskaits pieaudzis no 55 līdz 79 (24 jaunatklāti taksoni).

No 173 *Pachyrhynchus* ģints sugām, 160 izplatītas Filipīnu arhipelāgā: 79 izplatītas Luzona salā (46%), 51 Mindanao (29%), 19 Samar un Visayas salās (11%), 9 Mindoro (5%), 8 Panay un Lubang salās (5%). Viena suga konstatēta Romblon salā, kurā līdz šim *Pachyrhynchus* ģints sugas netika reģistrētas. Ārpus Filipīnu arhipelāga astoņas sugas izplatītas Taivānā un četras Indonēzijā. Sugu bioģeogrāfiskā izcelsme ir okeāniska, kas izskaidro iemeslu, kāpēc neviena no *Pachyrhynchus* ģints sugām nav sastopama Palawan un Sulu salās, kuras atdalītas no pamata Filipīnu arhipelāga salām ar barjeru. Palawan salas flora un fauna vairāk līdzinās Ķīnas, kamēr Sulu salu kompleksam ir sava unikāla flora un fauna, kas nelīdzinās tuvu esošās Mindanao salas faunai. *Pachyrhynchus* ģintī nav zināma neviena suga, kas būtu izplatīta Borneo vai Āzijas sauszemē, kas vēlreiz apstiprina faktu par sugu okeānisko izcelsmi un izplatību. Sugu izplatību ierobežo īpatņu nespēja pārvietoties lidojot, kā arī nepieciešamība pēc specifiskiem vides apstākļiem - kalnu ekosistēmām [25, 38].

Papildinātie izplatības dati atspoguļo, ka vairums sugu ir endēmas un sastopamas konkrētā salā, vai konkrētā salas daļā. Kopumā 12 sugas sastopamas vairāk kā vienā salā: *P. moniliferus* (Luzon, Mindoro, Samar), *P. multipunctatus* (Luzon, Samar), kamēr pārējās 10 izplatītas salu kompleksos, kur salas atdalījušās viena no otras pēdējā ledus laikmeta laikā (PAIC). Mindanao salu kompleksā: *P. speciosus*, *P. regius*, *P. venustus*, *P. signatus*), Luzona salu kompleksā: *P. orbifer*, *P. phaleratus*, *P. decussatus*, *P. apicatus*, *P. moellendorfi*, *P. rukmanee*). Pārējās 148 sugas izplatītas tikai vienā, konkrētā salā. Sugas, kuras izplatītas vairākās Filipīnu arhipelāga salās ar lielu varbūtību ir vecākas izcelsmes, un ir izplatījušās pa salām no Filipīnām līdz Ryukyu un Mollucas (Indonēzija). Šāda izplatība būtu iespējama Miocēna - Pleistocēna laikā, kad salas atradās tuvu viena otrai un izplatība ar augu vai citu dzīvnieku palīdzību būtu iespējama. Kā apstiprinājuši Schultze [87] un Su et. al. [95] pētījumi, *Pachyrhynchus* ģints sugu pasīva izplatība ar mātes augu palīdzību ir iespējama.

Analizējot sugu izplatību un sastopamību salu iekšienē, novērotas vairākas izplatības tendences. Mindanao salā Zamboanga un Bangsamoro reģioni raksturojami kā izolēti no pārējās salas, un sugu sastāvs ir unikāls, jeb nepārklājas ar pārējās salas sugu sastāvu. Salas vidusdaļā - Caraga, Soccskagen, Davao un salas dienvidos iespējama sugu plūsmas apmaiņa, piemēram, *P. anichtchenkoi* izplatīta visos Mindanao salas centrālajos reģionos un salas ziemeļos, bet nav sastopama Zamboanga. Apkopojot, Zamboanga Peninsula izplatītas trīs sugas, ziemeļu Mindanao 30, Davao 18, Soccskagen 23, Caraga

22 un Bangsamoro sešas sugas. Luzona salā arī novērojama sugu izplatība pa atsevišķiem, savā starpā saistītiem kalnu reģioniem. Cagayan ielejā izplatītas 47 sugas, Cordillera ielejā 39, centrālajā Luzonā 25, Calabarzon 20, Ilocos un Bicol 8, Marinduque sešas sugas.

Pamatojoties uz papildinātajiem izplatības datiem, kā arī ģints morfoloģisko pazīmju analīzi, iespējams izvirzīt hipotēzi, ka *Pachyrhynchus* ģints sugu izcelsme meklējama Luzona salā ar lielāko sugu daudzveidības intensitāti. Respektīvi, sugas no Luzona salas, kas uzskatāms par izplatības centru, virzījušās ziemeļu virzienā līdz Taivānas salām, kur Cagayan ielejas salās starp Luzonu un Taivānu sastopamas vairākas *P. orbifer* un *P. moniliferus* pasugas. Dienvidu virzienā sugas izplatījušās līdz Mindanao salai un Rietumu virzienā līdz tuvākajām Indonēzijas salām. To apstiprina arī Van Dam et al. [73] filoģenētiskie pētījumi, kas parāda, ka Mindanao salā izplatīto sugu ģenerācijas ir cēlušās no vairākām Luzona salā sastopamajām sugām.

### **PACHYRHYNCHUS GERMAR, 1824 MORFOLOĢISKO PAZĪMJU UN ĢENITĀLIJU STRUKTŪRU ANALĪZE**

Ģintij raksturīgas nelielas, no 10 līdz 30mm lielas vaboles ar reducētiem apakšspārniem; ķermeņa krāsojums: melns, zili-melns, vara krāsas, sarkans, violets, zelta vai zaļš; taustekļi melni; raksturīgi dažādu formu un lieluma krāsainu zvīņu plankumi uz galvas, priekškrūšu vairoga un segspārniem.

**Galva:** izteikti ovālas līdz noapaļotas formas; **Smeceris:** smeceris ir viena no galvenajām pazīmēm, pēc kurām ģints *Pachyrhynchus* tiek nodalīta no pārējām Pachyrhynchini ģintīm. *Pachyrhynchus* ģints smecernieku smeceris **dorsāli** - dziļa šķērsrieva smecera centrālajā daļā, viena šķērsrieva pieres pamatnē, starp acīm, apikālā daļa vairāk vai mazāk izliekta dorsāli, taisna šķērseniski, ar lielāku centrālo vai diviem mazākiem centrālajiem iespaidumiem, kas ir sugām specifiski; centrālā garenrieva sākot no pieres līdz šķērsrievai, garenrievas garums sugai specifisks: no pieres pamata, centrālās daļas vai distālās malas; bazālā daļa centrāli ar iespaidumu, kura forma un dziļums ir sugai specifiski: apļveida, trīsstūrveida vai kvadrātveida; **laterāli**- sānu skatā smeceris līdz vidusdaļā esošajai rievai taisns, apikālajā daļā izliekts dorsāli, virsotne nolaista ventrāli; bazālā daļa ar dziļu iespaidumu, kas ir sugai specifisks; **ventrāli**- apikālās daļas platums ir sugai specifiska, svarīga pazīme, atsevišķām sugām platums nepārsniedz taustekļu izeju dorsālā skatā, atsevišķām pārsniedz līdz 1/3 no smecera platuma katrā malā; smecera garuma un platuma attiecība vairumam sugu ir 1/1, ar iespējamu nobīdi kādā no virzieniem atkarībā no sugas; pieres struktūra sugai specifiska: gluda, ar vieglu vai dziļāku punktotumu; atsevišķām sugām smeceris dorsāli pārklāts ar īsiem matiņiem, citām to nav; sānu malas ar īsākiem matiņiem centrālajā daļā līdz gariem sariem mutēs rajonā; ventrālā daļa pilnībā noklāta ar gariem sariem; **Acis un vaigi:** salīdzinoši ar citām Pachyrhynchini ģintīm, *Pachyrhynchus* ģints pārstāvjiem ir vidēji lielas, sfēriskas acis, kas ir izliektas ārpus galvas kontūras; acu izliekums un lielums attiecībā pret pieres platumu ir sugai specifiska pazīme, kas variē sugu grupu līmenī no ¼ līdz ½ no pieres platuma. Vaigi vairumam sugu gludi, bieži marķēti ar atsevišķām apaļas vai ovālas formas zvīņām vai neregulāras formas zvīņu plankumu, var būt klāti ar īsiem, gaišiem matiem, kas paliek intensīvāki mutēs virzienā. Sugām ar lielākām, spēcīgāk ārpus galvas kontūras izliektām acīm uz vaigiem raksturīgs krokojums; **Pakausis (vertex):** daļēji nosegts ar priekškrūšu vairogu, vairumam sugu gluds vai ar nelielu punktotumu, taisns; **Sānu pakausis (tempus):** atkarībā no acu lieluma, iespējams izteikts krokojums sugām ar lielākām acīm un gluds sugām ar mazākām acīm; **Taustekļu eja:** dziļa, sākas īsi pie smecera sānu malas augšējā mutēs stūra, mēreni noapaļota ventrālā virzienā, spēcīgāks leņķis vidusdaļā, pēc kā taisna ventrālā virzienā, taustekļu izeja izvietota 1/3 no augšas ejas kopējā platumā.

**Taustekļi:** Taustekļi sastāv no 11 posmiem; **Izeja (scape):** pirmais taustekļu posms, kura garums līdzvērtīgs pārējo posmu saliktam garumam, attiecība var minimāli variēt atkarībā no sugas; forma piestiprinājuma vietā sašaurināta un paplašinās virsotnes virzienā, no sāniem forma saplacināta;

attiecībā pret acīm, izeja nenasniedz acs distālo malu; piestiprinājuma vieta izvietota smecera 1/3; **Funikuls (funicle)**: sastāv no septiņiem segmentiem (antennomeres), I segments garāks par citiem, garāks nekā plats; II segments īsāks par I, bet garāks par pārējiem segmentiem, garāks nekā plats; segmenti III līdz VIII līdzvērtīgi garumā un platumā, vienmērīgi palielinās virsotnes virzienā; I, II un III-VII segment precīza attiecība ir sugai specifiska pazīme; **Virsošne (club)**: ovālas līdz noapaļotas formas, sastāv no trīs segmentiem, kas vairumam sugu ir vienlīdzīgi plati, atsevišķām sugām II segments ir platāks vai pretēji – īsāks par I un III.

**Priekškrūšu vairogs**: gluda līdz nedaudz punktēta virsma, kas klāta ar variējošas formas un krāsu fotonu kristālu zvīņām, kas formē punktus, līnijas, plankumus vai neregulāras formas veidojumus; forma augšējā skatā spēcīgi variē atsevišķām sugu grupām: *P. moniliferus*, *P. erichsoni* sugu grupām raksturīga izteikti sfēriska priekškrūšu vairoga forma, ar spēcīgi noapaļotām sānu malām visa garumā, platākais punkts vidusdaļā, *P. congestus*, *P. ardentius* sugu grupām raksturīga ovāla priekškrūšu vairoga forma, augšējā skatā sānu malas no virsotnes ir mēreni nopaļotas, sasniedzot priekškrūšu vairoga platāko punktu pirms vidusdaļas, pēc kā sānu malas sašaurinās līdz  $\frac{3}{4}$  no garuma, iztaisnojas un nedaudz paplašinās apakšējās malas virzienā, *P. inclytus* sugu grupai raksturīga taisnstūrveida priekškrūšu vairoga forma, kur augšējā skatā sānu malas ir vāji nopaļotas; sānu skatā priekškrūšu vairoga izliekums variē no gandrīz taisna (*P. digestus*) līdz sfēriskam (*P. orbifer*); priekškrūšu vairoga augšējā mala vairumam sugu nedaudz izliekta galvas virzienā, ar raksturīgu rievu pirms malas, rievā var būt praktiski reducēta, sastāvēt no atsevišķiem punktiem vai būt nepārtraukta visa garumā; apakšējā mala taisna vai izliekta galvas virzienā, ar raksturīgu rievu pirms malas; priekškrūšu vairoga pamatne īpatsvaram sugu taisna vai ar atsevišķām krokām, klāta ar atsevišķiem, īsiem matiņiem.

**Vēders**: Vēdera pamatnes segmeti: I un II segmenti saauguši kopā, spēcīgi krokoti pie pakalģūžām, centrāli ar ieliekumu, apakšējā mala ar atsevišķām, retām fotonu kristālu zvīņām, daļēji pārklāj III segmentu; III segments minimāli izliekts, apakšējā mala taisna, struktūra taisna, sānu lamas minimāli krokotas, vairumam sugu katrā no sānu malām pa vienam zvīņu plankumam, atsevišķām sugām plankumu nav; IV un V segmenti taisni, sānu malas spēcīgāk krokotas; anālais segments izliekts pusaplī vai trīsstūrveida formā, ārējā mala biezi klāta ar īsiem, gaišiem matiņiem, iekšējā mala vidusdaļā vairumam sugu ieliekta; segmentu apmatojums ir sugām specifisks un var būt gan intensīvs ar garākiem, gaišiem matiņiem uz visiem segmentiem, ar intensīvāko apmatojumu virsotnē, vai pretēji, apmatojuma var nebūt izņemot virsotni; *metathorax* spēcīgi grumbuļains, ar raksturīgām rievām un izliekumiem gar gūžām, sānu malās īpatsvaram sugu izvietoti zvīņu plankumi, gluds vai ar atsevišķiem, īsiem, gaišiem matiņiem.

**Segspārni**: Segspārņu forma, analogi priekškrūšu vairogam, variē pa sugu grupām, izšķirot izteikti globulārus, saīsinātus segspārnus ar spēcīgi noapaļotām sānu malām augšskatā; ovālas formas, pagarinātus segspārnus ar mēreni noapaļotām sānu malām augšskatā; šaurus, lancetveida segspārnus; sergpārņu virsotne: smaile / noapaļota / izvirzīta, kvadrātveida formas; segspārni virsotnē var būt gan sakļauti, gan katrs segspārns ar atsevišķu virsotni; spēcīgākais dzimuma dimorfisms novērojams tieši segspārņu formā, jo mātīšu segspārni ir spēcīgāk izliekti, noapaļoti, dējēklis ir spēcīgi izvirzīts uz priekšu, bet tēviņiem ir raksturīga slaidāka segspārņu forma, segspārņu virsotne strupāka; segspārņu šuve vairumā gluda, atsevišķām sugām ar raksturīgu kroku; vairodziņš daļēji vai pilnīgi nosegts, forma trīsstūrveida līdz noapaļota; izšķir vairākus segspārņu struktūru veidus atkarībā no sugu grupas: segspārni gludi, bez izteiktiem intervāliem vai punktējuma (*P. smaragdinus*, *P. venustus*) / segspārni ar raksturīgu punktējumu, kas nav regulāri izvietots punktu joslās (*P. apoensis*, *P. nitcisi*) / segspārni ar punktojumu, kas izvietots regulārās punktu joslās attiecīgi segspārņu intervāliem, joslas neveido rievās (*P. orbifer*, *P. cabrasae*) / punktu joslas veido dziļākas vai seklākas rievās (*P. lacunosus*); vairumam sugu apmatojums tikai gar segspārņu virsotni īsu, gaišu matiņu veidā, atsevišķām sugām raksturīgi garāki mati visā segspārņu garumā; uz segspārniem izvietoti dažādu krāsu un formu punkti, plankumi,



līnijas, kas lielākoties savā formā ir relatīvi nemainīgi sugas līmenī, marķējuma krāsojums var būt mainīgs.

**Ekstremitātes:** Ekstremitāšu morfoloģiskā uzbūve būtiski neatšķiras visiem trim ekstremitāšu pāriem; gurni krokoti; augšstilbi sašaurināti pie pamatnes, paplašināti un izliekti ar platāko punktu vidusdaļā, ieliekti gar iekšmalu pirms virsotnes un noapaļoti virsotnē, var būt klāti ar krāsainu zvīņu joslu vai atsevišķām, krāsainām zvīņām vai bez zvīņu marķējuma, klāti ar īsiem, retiem matiņiem; apakšstilbi vienmērīgi plati visa garumā, ieliekti uz iekšu, iekšmala klāta ar garākiem matiem līdz nelieliem izaugumiem, pamatne atvērta tipa, ar mukroniem; pēdu I un II posmi vienlīdzīgi, III posms lielāks, nadziņi īsāki par pēdas garumu, pēdas augšdaļa reti klāta ar gariem, gaišiem matiem, apakša biezi pārklāta ar īsākiem matiņiem.

**Dzimumorgāni: Tēviņi:** Tēviņu dzimumorgānu forma ir īpaši svarīga pazīme sugu nodalīšanai. *Aedeagus* (dzimumorgāns) garums, platums un izliekums ir sugai specifiski. Īpatsvaram sugu dzimumorgāns sānu skatā ir izliekts uz aizmuguri aptuveni līdz vidusdaļai un vienmērīgi ieliekts uz iekšpusi, veidojot pusaplim līdzīgu formu, virsotnes forma var būt taisna, izliekta pamatnes virzienā, noapaļota, asa vai pagarināta kvadrātveida; dzimumorgāna ieeja (ostium) noapaļota abos galos vai asa pamatnē, līdz ar ārmalu vai veido pārkari pār ārmalu; paramēras ieliektas pamatnes virzienā, garums starp sugām variē no 1:3 līdz 1:1 attiecībā pret dzimumorgāna ķermeni; augšskatā dzimumorgāna forma lielākoties taisna visā garumā vai paplašināta pie pamatnes, virsotne sašaurināta, izvirzīta. **Mātītes:** Dējēkļa forma starp sugām maz atšķiras, variējot dējēkļa garumam atkarībā no sugas īpatņu lieluma; dējēklim augšskatā pie virsotnes ir divi izaugumi, pa vienam katrā pusē, kuru forma ir sugai specifiska, virsotne klāta ar retiem, gariem matiem; sternīts VIII pusapaļas formas, ar retiem, gariem matiem pie virsotnes gar ārmalu; spermatēkas virsotnes izliekums un izvirzījums sugai specifiski, pamatne taisna, ar ieliekumu vai ar izliekumu.

**Ģenitāliju struktūru analīze:** Papildus metode sugu atšķiršanai sugām, ar līdzīgas formas dzimumorgānu ir tēviņu dzimumorgāna iekšējā maisa formas un struktūru analīze. Starp sugām spēcīgi variē ejakulācijas kanāla forma, hitinizētais kopulācijas gals, izliekumi pie pamatnes, izliekums un forma sānu skatā vai skatā no augšas.

## PACHYRHYNCHINI TRIBAS JAUNATKLĀTIE TAKSONI

Kopējais jaunatklāto taksonu skaits Pachyrhynchini tribā sastāda **50** sugas un **četras** pasugas jeb **54 jaunatklāti taksoni**. Vienas sugas statuss paaugstināts no pasugas līdz sugas līmenim.

37 sugas un četras pasugas jaunatklātas un publicētas *Pachyrhynchus* ģintī: *P. kraslavae* Rukmane & Barševskis, 2016, *P. marinduquensis* Rukmane & Barševskis, 2016, *P. cabrasae* Rukmane & Barševskis, 2016, *P. nitcisi* Rukmane & Barševskis, 2016, *P. antonkozlovi* Rukmane & Barševskis, 2016, *P. shavrini* Rukmane & Barševskis, 2016, *P. anichtchenkoi* Rukmane & Barševskis, 2016, *P. valainisi* Rukmane & Barševskis, 2016, *P. barsevskisi* Rukmane, 2016, *P. domino* Rukmane, 2016, *P. pseudhalconensis* Rukmane, 2016, *P. rebus* Rukmane, 2016, *P. tiko* Rukmane, 2016, *P. miltoni* Cabras & Rukmane, 2016, *P. ilgas* Rukmane, 2017, *P. orientalis* Rukmane, 2017, *P. occidentalis* Rukmane, 2017, *P. neoabsurdus* Rukmane, 2017, *P. banglas* Bollino, Sandel & Rukmane, 2017, *P. esperanza* Bollino, Sandel & Rukmane, 2017, *P. felipeae* Rukmane & Cabras, 2018, *P. franciscoi* Rukmane & Cabras, 2018, *P. layroni* Rukmane & Cabras, 2018, *P. sergejevae* Rukmane, 2018, *P. torresi* Rukmane, 2018, *P. ottomerkli* Rukmane, 2019, *P. sagittatus* Rukmane, 2019, *P. tetramaculatus* Rukmane, 2019, *P. kirklayroni* Rukmane, 2019, *P. aedamlayroni* Rukmane, 2019, *P. mindoroensis* Rukmane & Hava, 2020, *P. yoshitakei* Bollino, Rukmane & Mohagan, 2020, *P. imitans* Bollino, Rukmane & Mohagan, 2020, *P. bollinoi* Rukmane-Bārbale, 2020, *P. cinereomaculatus* Rukmane-Bārbale, 2020, *P. subpalidius* Rukmane-Bārbale, 2022; *P. cebrem* Patano & Rukmane-Bārbale, 2023;

*P. möllendorffi marinduquanus* Rukmane, 2018, *P. moniliferus babuyanensis* Rukmane, 2018, *P. moniliferus herbidus* Rukmane, 2018, *P. decussatus catanduanensis* Rukmane-Bārbale, 2020;

*P. cruciatus* Schultze, 1923 taksonomiskais status ir paaugstināts līdz sugas līmenim.

Viena suga jaunatklāta un publicēta *Apocyrtus* ģintī: *A. auroraensis* Rukmane-Bārbale, 2020;

Četras sugas jaunatklātas un publicētas *Eupachyrhynchus* ģintī: *E. auromaculatus* Rukmane, 2019, *E. barbalsi* Rukmane, 2019, *E. barsevskisi* Rukmane, 2019, *E. viridimaculatus* Rukmane, 2019;

Viena suga jaunatklāta un publicēta *Expachyrhynchus* ģintī: *E. palawanensis* Rukmane, 2019;

Trīs sugas jaunatklātas un publicētas *Macrocyrtus* ģintī: *M. (M.) stellarum*, Rukmane, 2019, *M. (E.) caerulans* Rukmane, 2019, *M. (E.) fulgidus* Rukmane, 2019;

Divas sugas jaunatklātas un publicētas *Trichomacrocyrtus* ģintī: *T. caerulans* Rukmane, 2019, *T. nubes* Rukmane-Bārbale, 2022;

Divas sugas jaunatklātas un publicētas *Pseudapocyrtus* ģintī: *P. madelaensis* Rukmane-Bārbale, 2021, *P. robertsstasinskisi* Rukmane-Bārbale, 2021.

Sugu apraksti izveidoti detalizēti analizējot katra taksona morfoloģiskās pazīmes. Katram taksonam atrastas specifiskas, sugai raksturīgas īpašības, kas iekļautas sugas aprakstā. Kā viena no galvenajām pazīmēm sugu atšķiršanai izmantota tēviņu dzimumorgānu forma, kas, pateicoties cietajam hitīna slānim, ir nemainīga sugas ietvaros, bet variē starp atsevišķām sugām.

Viena no metodēm *Pachyrhynchus* ģints sugu klasifikācijai ir sugu dalīšana sugu grupās, kur katrā sugu grupā iekļauts sugu kopums ar grupai specifisku pazīmju sastāvu. Šāda metode izmantota ērtākai un saprotamākai sugu atdalīšanai, uzsverot, ka sugu dalīšanai pa grupām nav taksonomiskas nozīmes. Šādu metodi izmantoja Schultze un Heller, sadalot *Pachyrhynchus* ģinti septiņās (Heller)

## SECINĀJUMI

1. Orientālajā faunā *Pachyrhynchini* tribas ietvaros ir uzskaitīta 641 suga, kas pieder 17 ģintīm, 173 sugas pieder *Pachyrhynchus* Germar, 1824 ģintij. Pētījuma rezultātā 50 sugas un četras pasugas *Pachyrhynchini* tribas ietvaros konstatētas kā zinātnei jaunas, 37 sugas un četras pasugas jaunatklātas *Pachyrhynchus* Germar, 1824 ģintī. Šīs ģintis ir viegli atšķiramas pēc smecera īpašībām, segspārnu formas, taustekļu pirmā posma garuma un citām ģintij raksturīgām pazīmēm.
2. Darba gaitā iegūtie faunistiskie dati ievērojami paplašina priekšstatu par Orientālā reģiona faunas smecernieku sugu daudzveidību, izplatību un sastopamību. Kopumā 152 sugām precizēta izplatība un papildināts izplatības areāls, dati par 21 sugu zināmi vienīgi no oriģināl apraksta. *Pachyrhynchus* ģints izplatības dati apkopoti zinātniskajā publikācijā. Kopumā 79 sugas (46%) izplatītas Filipīnu arhipelāga lielākajā salā – Luzonā, 51 Mindanao (29%), 19 Samar un Visayas salās (11%), deviņas Mindoro (5%), astoņas Panay un Lubang salās (5%), 12 sugas izplatītas ārpus Filipīnu arhipelāga Taivānas un Indonēzijas salās.
3. Pētījumu rezultātā sastādīts Orientālā reģiona *Pachyrhynchus* Germar, 1824 ģints faunas anotētais katalogs, kurā tika iekļautas 145 sugas. Kopš kataloga publicēšanas ģints ietvaros aprakstītas un publicētas 28 jaunas sugas.

4. Pētījuma ietvaros ievākti unikāli dati par Pachyrhynchini tribas bioloģiju vairākās aizsargājamās teritorijās Mindanao salā, kas apkopoti trīs publikācijās. Secināts, ka *Pachyrhynchus* ģints īpatņiem noteicošais vides faktors ir augstums virs jūras līmeņa un īpatņi ir sastopami sākot ar 700m un augstāk, atšķirībā no radniecīgās *Metapocyrtus* ģints, kur īpatņi sastopami zemākos augstumos un urbanizētā apvidū.
5. Secināts, ka tālu radniecīgu sugu atšķiršanai iespējams izmantot ārējās morfoloģiskās pazīmes, tādas kā segspārnu un priekškrūšu vairoga forma, sugu grupu atšķiršanai tēviņu dzimumorgāna formu un mātītes spermatēkas formu, bet iekš sugu grupām tēviņu dzimumorgāna iekšējā maisa formu.

## IZMANTOTĀ LITERĀTŪRA

1. Agassiz L. 1846. Nomenclatoris zoologici index universalis continens nomina systematica classium, ordinum, familiarum et generum animalium omnium, tam viventium quam fossilium, secundum ordinem alphabeticum unicum disposita, adjectis homonymiis plantarum, nec non variis adnotationibus et emendationibus. 8: 393.
2. Alonso-Zarazaga M. A., Lyal C. H. C. 1999. A world catalogue of families and genera of Curculionidea (Insecta: Coleoptera) (Excepting Scolytidae and Platypodidae). Barcelona, Entomopraxis, 170-350.
3. Behrens W. 1887. Materialien zu einer Monographie der Curculionengruppe Pachyrrhynchidae. Stettiner Entomologische Zeitung, 48(7-9): 211 - 257.
4. Berthold A. A. 1827. Latreille's Natarliche Familien des Thierreichs mit Anmerkungen und Zusdtzen. Weimar, Industr. Compt., 8: 602.
5. Blanchard E. 1853. Description des Insectes. Dumont-d'Urville, Capitaine de vaisseau. Zoologie, 4: 422.
6. Bollino M., Bordoni A. 2021. Two new species of *Metapocyrtus* (*Metapocyrtus*) Heller 1912 from Mindanao, Philippines (Curculionidae, Entiminae, Pachyrrhynchini). Zootaxa, 4991(2): 363 - 370.
7. Bollino M., Guerlach G. 2021. A new *Metapocyrtus* from Luzon (Philippines) (Curculionidae, Entiminae, Pachyrrhynchini). Journal of Tropical Coleopterology, 2(1): 1 - 8.
8. Bollino M., Medina M. N., Cabras A. 2020. Three new *Metapocyrtus* Heller, 1912 (Curculionidae, Entiminae, Pachyrrhynchini) from Mindanao Island, Philippines. Journal of Tropical Coleopterology, 1(1): 26 - 38.
9. Bollino M., Sandel F. 2015. Three new species of the genus *Pachyrrhynchus* Germar, 1824 from Lubang Island (Philippines) (Curculionidae: Entiminae: Pachyrrhynchini). Munis Entomology & Zoology, 10(2): 392 - 401.
10. Bollino M., Sandel F. 2017. Two new taxa of the subgenus *Artapocyrtus* Heller, 1912, genus *Metapocyrtus* Heller, 1912 from the Philippines (Coleoptera, Curculionidae, Entiminae, Pachyrrhynchini). Baltic Journal of Coleopterology, 17(1): 1 - 14.
11. Bollino M., Sandel F., Yoshitake H. 2019. Four new species of the genus *Metapocyrtus* Heller, subgenus *Artapocyrtus* Heller (Coleoptera, Curculionidae, Entiminae) from the Philippines. Elytra, New Series, 9(2): 395 - 407.
12. Bollino M., Sandel F., Yoshitake H. 2019. Four new species of the genus *Metapocyrtus* Heller, subgenus *Artapocyrtus* Heller (Coleoptera, Curculionidae, Entiminae) from the Philippines. Elytra, Tokyo, New Series, 9(2): 395 - 407.
13. Bollino M., Yoshitake H., Sandel F. 2019. A new species of the genus *Metapocyrtus* Heller, 1912, subgenus *Artapocyrtus* Heller, 1912 (Coleoptera, Curculionidae, Entiminae) from Catanduanes Island, the Philippines. Elytra, Tokyo, New Series, 9(1): 167 - 176.
14. Cabras A. A., Yoshitake H. 2016. Distributional and ecological notes on *Pachyrrhynchus apoensis* (Coleoptera, Curculionidae, Entiminae). Elytra, New Series, 6(1): 10 - 12.
15. Cabras A. A., Bollino M., Medina M. N. 2018. A new species of the subgenus *Orthocyrtus*, genus *Metapocyrtus* (Coleoptera, Curculionidae, Entiminae, Pachyrrhynchini) from Mindanao, with notes on its ecology. Baltic Journal of Coleopterology, 18(1): 39 - 46.
16. Cabras A. A., Lam A. W., Van Dam M. H. 2021. *Metapocyrtus* um sp. nov., a new weevil species (Coleoptera, Curculionidae, Entiminae, Pachyrrhynchini) from Davao City, Mindanao Island, Philippines. Zootaxa, 5068(4): 597 - 600.
17. Cabras A. A., Madjos G., Medina M. N. 2020. A new *Metapocyrtus* Heller, 1912 (Curculionidae: Entiminae: Pachyrrhynchini) from Zamboanga Peninsula, Mindanao Island, Philippines. Journal of Tropical Coleopterology, 1(2): 12 - 20.
18. Cabras A. A., Medina M. N. 2019. *Metapocyrtus ginalopezae* sp. n., a new *Orthocyrtus* from

- Davao de Oro, Mindanao Island. *Baltic Journal of Coleopterology*, 19(2): 205 - 211.
19. Cabras A. A., Medina M. N. 2021. Four new species of *Metapocyrtus* Heller, 1912 (Coleoptera, Curculionidae, Entiminae, Pachyrhynchini) from Mindanao Island, Philippines. *Biodiversity Data Journal*, 9(1): 1 - 20.
  20. Cabras A. A., Medina M. N. D. 2018. *Metapocyrtus* (*Artapocyrtus*) *willietorresi* sp. n. (Coleoptera: Curculionidae) from Southern Mindanao (Philippines), with notes on its ecology and mimicry complex. *Baltic Journal of Coleopterology*, 18(2): 185 - 192.
  21. Cabras A. A., Medina M. N. D., Zhang G. 2019. *Metapocyrtus kitangladensis* sp. n., a new *Pachyrhynchus cumingii* GR Waterhouse, 1841 mimic from Mindanao Island, Philippines. *ZooKeys*, 853: 119 - 129.
  22. Cabras A. A., Medina M. N., Bollino M. 2021. Two new species of the genus *Metapocyrtus* Heller, 1912 (Coleoptera, Curculionidae, Entiminae, Pachyrhynchini), subgenus *Orthocyrtus* Heller, 1912, from Mindanao Island, Philippines. *ZooKeys*, 1029(1): 139 - 154.
  23. Cabras A. A., Medina M. N., Donato J., Van Dam M. H. 2021. *Pachyrhynchus obumanuvu* sp. nov., a new species of easter egg weevil (Coleoptera, Curculionidae, Entiminae, Pachyrhynchini) from Mindanao Island, Philippines. *Baltic Journal of Coleopterology*, 21(1): 43 - 48.
  24. Cabras A. A., Medina M. N., Madjos G., Bollino M. 2022. Three new species of the genus *Metapocyrtus* Heller, 1912, subgenus *Orthocyrtus* Heller, 1912 (Coleoptera, Curculionidae, Entiminae, Pachyrhynchini), from Mindanao Island, Philippines. *ZooKeys*, 1088: 115 - 128.
  25. Cabras A. A., Nique G., Mohagan A. 2016. Diversity and distribution of pachyrhynchini (Coleoptera: Curculionidae: Entiminae) in Mt. Apo Natural Park, Philippines. *Journal of Biodiversity and Environmental Sciences*, 8(2): 312 - 319.
  26. Cabras A. A., Quimpan H. P., Medina M. N. 2021. *Metapocyrtus poncei* sp. nov., a new weevil (Coleoptera, Curculionidae, Entiminae, Pachyrhynchini) from Davao Oriental, Mindanao Island, Philippines. *Journal of Tropical Coleopterology*, 2(2): 30 - 36.
  27. Cabras A. A., Torrejos C., Medina M. N. 2021. *Metapocyrtus dagtum* sp. nov., a new flightless weevil from Davao de Oro, Mindanao Island, Philippines (Coleoptera: Curculionidae: Entiminae: Pachyrhynchini). *Biodiversity Data Journal*, 9: 1 - 11.
  28. Cabras A. A., Villanueva R. J., Medina M. N. 2021. A new species of *Metapocyrtus* Heller, 1912 (Coleoptera, Curculionidae, Entiminae) from Mindanao Island, Philippines. *Journal of Tropical Coleopterology*, 2(1): 35 - 41.
  29. Cabras A. A., Villanueva R. J., Medina M. N. 2021. Two new species of *Metapocyrtus* Heller 1912 (Coleoptera: Curculionidae: Entiminae: Pachyrhynchini) from Davao de Oro Mindanao Island, Philippines. *Baltic Journal of Coleopterology*, 21(1): 95 - 103.
  30. Chang Y., Ogawa Y., Jacucci G., Onelli O. D., Tseng H-Y., Vignolini S. 2020. Hereditary character of photonics structure in *Pachyrhynchus sarcitis* weevils: color changes via one generation hybridization. *Advanced optical materials*, 2000432: 1 - 7.
  31. Chen Y-T., Tseng H-Y., Jeng M-L., Su Y-C., Huang W-S., Lin C-P. 2017. Integrated species delimitation and conservation implications of an endangered weevil *Pachyrhynchus sonani* (Coleoptera: Curculionidae) in Green and Orchid Islands of Taiwan. *Systematic Entomology*, 42: 796 - 813.
  32. Chevrolat L. A. 1841. Description de trente quatre especes de Coleopteres de Manille et d'un tricondyle de Ceylan. *Revue zoologique*, 221 - 228.
  33. Chevrolat L. A. 1879. Descriptions de nouvelles especes de Coleopteres la famille des Curculionides. *Bulletin de la Societe Entomologique de France*.
  34. Chevrolat L. A. A. 1881. Diagnoses de Curculionides exotiques. *Le Naturaliste* 1(62): 494 - 495.
  35. Dam M. H., Cabras A., Henderson J. B., Estrada C. P., Omer A., Dudchenko O., Aiden E. L.,

- Lam A. 2021. The easter egg weevil (*Pachyrhynchus*) genome reveals synteny in Coleoptera across 200 million years of evolution. *PLOS Genetics*, 17(8): 1 - 27.
36. Dam M. H., Cabras A., Lam A. 2021. How the easter egg weevils got their spots: Phylogenomics reveals Mullerian mimicry in *Pachyrhynchus* (Coleoptera, Curculionidae). *bioRxiv*.
  37. Desmarest E. 1842. Coleopters. Voyage autour du Monde executependant les annees. Sur la corvette La Bonile commandee par M. Vaillant. *Zoologie*. 1+334 pp.
  38. Dickerson R. E. 1928. Distribution of life in the Philippines. *Monographs of the Bureau of Science*. 21: 1 – 322.
  39. Erichson W. F. 1834. *Coleoptera*. pp. 219 - 276.
  40. Eydoux & Soulayet 1839. *Travaux inedits. Quelques nouvelles especes d'oiseaux, par Fr. de La Fresnaye. Revue Zoologique*: 266.
  41. Fairmaire L. 1897. *Coleopteres de l'Inde et de la Malaisie. Notes from Leyden Museum*, 18(4): 225 - 240.
  42. Faust J. 1892. Fünfneue Curculioniden von Australien. *Stettiner Entomologische Zeitung*, 53(7-9): 179-184.
  43. Faust J. 1895. Einige neue Luzon-Curculioniden des Museum Tring. *Stettiner Entomologische Zeitung*, 56: 3 - 21.
  44. Gemminger M. And Harold E. 1871. *Catalogus Coleopterorum hucusque descriptorum synonymicus etsystematicus. Yol. 8. Curculionidae. Monachii, E. H. Gumnri (G. Beck). Pp. 2181-2668+ 10 pp.*
  45. Genka M., Yoshitake H. 2018. A list of *Metapocyrtus* weevils (Coleoptera, Curculionidae, Entiminae) intercepted at import plant quarantine in Japan, with descriptions of two new species. *Elytra, Tokyo, New Series*, 8(2): 249 - 262.
  46. Genka M., Yoshitake H. 2019. Two new species of the genus *Macrocyrtus* Heller (Coleoptera, Curculionidae, Entiminae) from Luzon, the Philippines. *Elytra, Tokyo, New Series*, 9(1): 155 - 165.
  47. Germar E. F. 1824. *Insecten in Bernstein eingeschlossen, beschrieben aus dem academischen Mineralien - Cabinet zu Halle. Magazin der Entomologie*, 1(1): 11-18.
  48. Heller K. M. 1899. Neue kafer von den Philippinen. *Abhandlungen der Berichte des Koniglichen Zoologischen und Anthropologische-Ethnographischen Museums zu Dresden* 7(8): 1 - 8.
  49. Heller K. M. 1908. Vierter Beitrag zur Papuanischen Kilferfauna. *Abhandlungen und Berichte des Konig. Zoologischen und Anthropologisch Ethnographischen Museums zu Dresden* 12(1): 34.
  50. Heller K. M. 1912. Philippinische Russelklfer. *Philippine Journal of Science*, 7(5): 295-346.
  51. Heller K. M. 1921. New Philippine Coleoptera. *Philippine Journal of Science*, 19 (5): 523-627.
  52. Heller K. M. 1923. Curculiollidae und Brenthidae. In: EBNER, R. *Wissenschaftliche Ergebnisse der mit UnterstOtzung der Akademie der Wissenschaftell in Wien aus der Erbschaft Treitl von F. Werner unternommenen zoologischen Expedition nach dem anglilgyptischen Sudan (Kordofan) 1914. XI. Coleoptera A. Denkschriften der mathematischnaturwissenschaftliche Klasse der Akademie der Wissenschaften in Wien* 98, 165 - 199.
  53. Heller K. M. 1929. Neue philippinische Russelkafer aus der Tribus *Pachyrrhynchini*. *Wiener Entomologische Zeitung*, 46(1): 1 - 19.
  54. Heyne A. And Taschenberg O. 1907. *Die emtischen Ktifer in Wort und Bild*. Leipzig, 219-262.

55. Hsu C-F., Tseng H-Y., Hsiao Y., Ko C-C. 2017. First record of the host plant and larvae of *Pachyrhynchus sonani* (Coleoptera: Curculionidae) on Lanyu Island, Taiwan. *Entomological Science*, 20(2): 288 - 291.
56. Huang L-C., Huang W-S., Lin C-P., Nuneza O. M., Tseng H-Y., Tang H-C 2018. Captive breeding of two insular populations of *Pachyrhynchus sarcitis* (Coleoptera: Curculionidae) from Lanyu and Babuyan Islands. *Journal of Asia-Pacific entomology*, 21: 1233 - 1238.
57. Ienistea M. A. 1986. A new hierarchical system of Arthropoda, mainly referring to insects. *YES Quarterly*, 3(2): 13-38.
58. INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE. 1970. Opinion 928. *Pachyrhynchus* Gennar, 1824 (Insecta: Coleoptera): validated under the plenary powers. *Bulletin of Zoological Nomenclature*, 27(2): 93-94.
59. INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE. 1994. Opinion 1770. *Pachyrhynchus* Germar, 1824, *Somatodes* Schoenherr, 1840 and the specific name of *Pachyrhynchus moniliferus* Germar, 1824 (Insecta, Coleoptera): conserved. *Bulletin of Zoological Nomenclature*, 51 (2): 170-171.
60. Kano T. 1936. Some problems concerning the biogeography of Kotosho. *Geographical Review of Japan*, 12: 1107 - 1133.
61. Kono H. 1929. Kurzrussler aus dem japanischen Reich. *Journal of the Faculty of Agriculture, Hokkaido Imperial University*, 24(5): 153 - 242.
62. Kono H. 1942. Die Russelkafer auf der Insel Kotosho. *Insecta Matsamurana*, 16: 22-27.
63. Kraatz G. 1888. Anhang. 1. *Doreadion blanchardi* Mulsant, 75-76S. In: Heyden L. F. J. D. Von.: Neue und interessante Coleopteren aus Malatia in Mesopotamien. *Deutsche Entomologische Zeitschrift*, 32: 72 - 78.
64. Kuntzen H. 1914. Einige Ergänzungen zu zwei Arbeiten K. M. Hellers über Russelkafer. *Berliner entomologische Zeitschrift*, 4: 448 - 454.
65. Laporte F. L. 1840. *Histoire Naturelle des Animaux Articulés, Annelides, Crustacés, Arachnides, Myriapodes et Insectes. Histoire Naturelle des Insectes Coleopteres. Avec une Introduction renfermant l'anatomie et la physiologie des animaux articulés, par M. Brulle*, 2: 563.
66. Latreille P. A. 1828. *Rhynchophores ou Portebec*. Bory de Saint-Vincent, 584-603.
67. Latreille P. A. 1825. *Familles Naturelles du Règne Animal*. Paris. Baillière. 570 pp.
68. Lee C-Y., Yo S-P., Clark R. W., Hsu J-Y., Liao C-P., Tseng H-Y., Huang W-S. 2018. The role of different visual characteristics of weevils signalling aposematism to sympatric lizard predators. *Journal of Zoology*, 306: 36 - 47.
69. Lin S-M., Li T-W., Liou C-H., Amaraga A. K. S., Cabras A., Tseng H-Y. 2021. Eggs survive through avian guts - A possible mechanism for transoceanic dispersal of flightless weevils. *Ecology and Evolution*, 00: 1 - 6.
70. Mohagan A. B., Patano Jr. R. R., Hongco A. L., Lagunday N. F., Cortico F. P., Amoroso V. B. 2018. Species occurrence of weevils (Coleoptera: Curculionidae) in the Baganihan, Marilog Forest Reserve, Marilog District, Davao City, Philippines. *Journal of Biodiversity and Environmental Sciences*, 13(2): 30 - 34.
71. Mohagan A. B., Patano Jr. R. R., Melencion M. G., Salas D. S., Cortico F. P., Amoroso V. B. 2020. Diversity of weevils (Coleoptera) in Marahan, Marilog Forest Reserve, Southern Mindanao, Philippines. *Journal of Tropical Science*, 10(3): 259 - 270.
72. Oberthur R. 1879. Notes sur quelques Coleopteres recoltés aux îles Sanghir par les chasseurs de M. A. A. Bruijn et description de trois espèces nouvelles. *Annali del Museo Civico di storia di Genova*, 14: 570 - 571.
73. Parisotto A., Steiner U., Cabras A. A., Van Dam M. H., Wilts B. D. 2022. *Pachyrhynchus* weevils use 3D photonic crystals with varying degrees of order to create diverse and brilliant displays. *Small*, 2200592: 1 - 13.

74. Pascoe F. P. 1871. Contributions towards a Knowledge of the Curculionidae. Zoological Journal of the Linnean Society, 154 - 218.
75. Patano Jr. R. R., Amoroso V. B., Mohagan A. B., Guiang M. M. M., Yap S. A. 2021. Two new species of the genus *Metapocyrtus* Heller, 1912 (Coleoptera: Curculionidae: Entiminae), from Mindanao Island and an updated checklist of *Metapocyrtus* species in the Philippines. Raffles bulletin of Zoology, 69: 282 - 303.
76. Patano Jr. R. R., Amoroso V. B., Mohagan A. B., Maglangit E. P. T., Cortico F. P., Yap S. A. 2022. Two new species of *Metapocyrtus* Heller, 1912 (Coleoptera: Pachyrhynchini) from Mount Natampod, Pantaron Range, Bukidnon, Mindanao, Philippines. Philippine Journal of Science, 152(2): 767 - 778.
77. Patano Jr. R. R., Mohagan A. B., Amoroso V. B., Cortico F. P., Yap S. A. 2020. A new species of *Metapocyrtus* (Curculionidae: Entiminae: Pachyrhynchini) from Southern Mindanao, Philippines. Philippine Journal of Systematic Biology, 14(3): 1 - 5.
78. Sakaguchi S. 1927. The provisional list of the insects collected in Okinawa Islands. Wakayama Normal School, Japan.
79. Sandel F., Bollino M. 2018. Four new species of *Metapocyrtus* Heller, 1912, from Mindoro Island, Philippines (Coleoptera, Curculionidae, Entiminae, Pachyrhynchini). Baltic Journal of Coleopterology, 18(2): 139 - 158.
80. Schoenherr C. J. 1826. Curculionidum dispositio methodica cum generum characteribus, descriptionibus atque observationibus varlis seu Prodrum ad Synonymiae Insectorum. partem IV. Lipsiae. Fleischer, 10 + 338 pp.
81. Schoenherr C. J. 1845. Genera et Species Curculionidum, Cum Synonymia Hujus Familiae. Species Novae aut Hactenus Minus Cognitae, Descriptionibus a Dom. L. Gyllenhal, C. H. Boheman, O. J. Fahraeus, et Entomologis Aliis Illustratae. Pars Secunda. Supplementum continens Roret, 8: 504 pp.
82. Schultze W. 1916. A catalogue of Philippine Coleoptera. The Philippine Journal of Science, 11(2): 95 - 194.
83. Schultze W. 1917. Fourth contribution to the coleoptera fauna of the Philippines. The Philippine Journal of Science, 12(4): 249 - 259.
84. Schultze W. 1919. Seventh contribution to the Coleoptera fauna of the Philippines. The Philippine Journal of Science, 15(6): 545 - 561.
85. Schultze W. 1920. Fauna of the Philippines. The Philippine Journal of Science, 16: 191.
86. Schultze W. 1922. Neunte Beitrag zur Coleopteren fauna der Philippinen. The Philippine Journal of Science, 21(6): 569 - 596.
87. Schultze W. 1923. A monograph of the Pachyrhynchid group of the Brachyderinae, Curculionidae: Part I. The genus *Pachyrhynchus* Germar. The Philippine Journal of Science, 23: 609 - 673.
88. Schultze W. 1924. The Philippine Journal of Science, 24: 309 - 366.
89. Schultze W. 1924. A monograph of the Pachyrhynchid group of the Brachyderinae, Curculionidae: Part II. The genera *Eupachyrhynchus*, *Macrocyrtus*, *Eumacrocyrtus*, *Apocyrtus*, *Proapocyrtus*, *Pseudapocyrtus*, *Nothapocyrtus*, and *Exnothapocyrtus*. The Philippine Journal of Science, 24(3): 359-390.
90. Schultze W. 1925. The Philippine Journal of Science, 26: 131 - 309.
91. Schultze W. 1934. Thirteenth contribution to the Coleoptera fauna of the Philippines. The Philippine Journal of Science, 53(3): 331 - 337.
92. Snellen van Vollenhoven S. C. 1864. Description de quelques especes de coleopteres. Tijdschrift voor Entomologie, (7): 145 - 170.
93. Stein J. P. E. F. 1868. Catalogus Coleopterorum Europae. Berolini, Friderici Nicolai, 4: 149.
94. Stjorm J. 1826. Catalog meiner Insecten-Sammlung. Erser Theil. Kaer. Nilmburg, 8+208+16.
95. Su Y. C., Wang J. F., Villanueva R. J. T., Nuneza O. M., Lin C. P. 2014. Hopping out of



- Mindanao: Micene – Pleistocene geological processes and cross island dispersal as major drivers of diversity for Philippine treehoppers. *Journal of Biogeography*, 41 (7): 1277 – 1290.
96. Tseng H-Y., Huang W-S., Jeng M-L., Villanuava R. J. T., Nuneza O. M., Lin C-P. 2017. Complex inter-island colonization and peripatric founder speciation promote diversification of flightless *Pachyrhynchus* weevils in the Taiwan-Luzon volcanic belt. *Journal of Biogeography*, 1 - 12.
  97. Waterhouse G. R. 1841. XLV. Descriptions of the Species of the Curculionideous Genus *Pachyrhynchus*, Sch., collected by H. Cuming, Esq., in the Philippine Islands. By G. R. Waterhouse, Esq., V. P. E. S. Mr. G. R. Waterhouse's Descriptions of the Species of the Genus *Pachyrhynchus*: 310 - 327.
  98. Waterhouse G. R. 1853. Descriptions of new genera and species of Curculionides. *Transactions of the Entomological Society of London*, 2(5): 172-176.
  99. Yap S. 2008. Checklist of the *Metapocyrtus* complex (Curculionidae: Entiminae: *Pachyrhynchini*) of the Philippines. *Asia Life Sciences*, 17(2): 249 - 260.
  100. Yap S., Gapud V. P. 2007. Taxonomic review of the genus *Metapocyrtus* Heller (Coleoptera: Curculionidae: Entiminae). *The Philippini Entomologist*, 21(2): 115 - 135.
  101. Yeh H-Y., Tseng H-Y., Lin C-P., Liao C-P., Hsu J-Y., Huang W-S. 2018. Rafting of floating fruit is effective for oceanic dispersal of flightless weevils. *Journal of Experimental Biology*, 221 (190488): 1 - 8.
  102. Yoshitake H. 2011. A new species of the subgenus *Artapocyrtus* of the genus *Metapocyrtus* (Coleoptera: Curculionidae: Entiminae) from Mindanao, the Philippines. *Esakia*, 50: 115 - 119.
  103. Yoshitake H. 2012. Nine new species of the genus *Pachyrhynchus* Germar (Coleoptera: Curculionidae) from the Philippines. *Esakia*, 52: 17 - 34.
  104. Yoshitake H. 2013. A new genus and two new species of the tribe *Pachyrhynchini* (Coleoptera: Curculionidae) from Palawan Island, the Philippines. *Esakia*, 53: 1 - 8.
  105. Yoshitake H. 2016. A new synonymy of *Pachyrhynchus apoensis* Yoshitake (Coleoptera, Curculionidae, Entiminae). *Elytra*, Tokyo, New Series, 6(2): 197 - 198.
  106. Yoshitake H. 2017. Notes on *Pachyrhynchini* jewel weevils (Coleoptera: Curculionidae: Entiminae) and other insects showing remarkable resemblance in color and body pattern characteristics. *Gekkan-Mushi*, 553: 22 - 40.
  107. Yoshitake H. 2017. Notes on *Pachyrhynchus* Jewel weevils (Coleoptera, Curculionidae, Entiminae) from the Papuan Region. *Elytra*, Tokyo, New Series, 7(1): 241 - 246.
  108. Yoshitake H. 2017. Six new taxa and a new synonym of the genus *Pachyrhynchus* Germar (Coleoptera, Curculionidae, Entiminae) from the Philippines. *Elytra*, Tokyo, New Series, 7(1): 247 - 263.
  109. Yoshitake H. 2017. A new genus and new species of the tribe *Pachyrhynchini* (Coleoptera, Curculionidae, Entiminae) from the Philippines. *Elytra*, Tokyo, New series, 7(2): 519 - 525.
  110. Yoshitake H. 2018. A new genus and two new species of the tribe *Pachyrhynchini* (Coleoptera, Curculionidae, Entiminae) from the Philippines. *Elytra*, Tokyo, New Series, 8(1): 5 - 14.
  111. Yoshitake H. 2018. Occurrence of *Pachyrhynchus croesus* Oberthur (Coleoptera, Curculionidae, Entiminae) on Salibabu Is., the Talaud Is., Indonesia. *Elytra*, Tokyo, New Series, 8(1): 15 - 16.
  112. Yoshitake H. 2018. Occurrence of *Pachyrhynchus forsteni* Snellen van Vollenhoven (Coleoptera, Curculionidae, Entiminae) on Makian Is., the Maluku Is., Indonesia. *Elytra*, Tokyo, New Series, 8(1): 17 - 18.
  113. Yoshitake H. 2018. A new subspecies of *Pachyrhynchus multipunctatus* Waterhouse (Coleoptera, Curculionidae) from Cebu Is., the Philippines. *Elytra*, Tokyo, New Series, 8(2):

245 - 248.

114. Yoshitake H. 2019. Two new species of the jewel genus *Pachyrhynchus* Germar (Coleoptera: Curculionidae: Entiminae) from Luzon, the Philippines. *Gekkan-Mushi*, 576: 22 - 27.
115. Yoshitake H. 2019. Three new species and a new subspecies of the jewel weevil genus *Pachyrhynchus* Germar (Coleoptera: Curculionidae: Entiminae) from the Philippines. *Gekkan-Mushi*, 578: 36 - 43.
116. Yoshitake H. 2019. *Pachyrhynchus striatus* Waterhouse, 1841, a new synonym of *Pachyrhynchus roseomaculatus* Waterhouse, 1841 (Coleoptera, Curculionidae, Entiminae). *Elytra*, Tokyo, New Series, 9(1): 193 - 195.
117. Yoshitake H. 2019. Two new species of the jewel genus *Pachyrhynchus* Germar (Coleoptera: Curculionidae: Entiminae) from northern Luzon, the Philippines. *Gekkan-Mushi*, 582: 34 - 39.
118. Yoshitake H. 2019. Precise locality of *Pachyrhynchus roseomaculatus* Waterhouse (Coleoptera, Curculionidae, Entiminae) in the Philippines. *Elytra*, New Series, 9(2): 378 - 378.
119. Yoshitake H. 2019. *Pachyrhynchus sibuyanensis* Rukmane, 2019, a new synonym of *Pachyrhynchus naokae* Yoshitake, 2019 (Coleoptera, Curculionidae, Entiminae). *Elytra*, New Series, 9(2): 408 - 408.
120. Yoshitake H. 2019. Two new species of the genus *Pachyrhynchus* Germar (Coleoptera, Curculionidae, Entiminae) from Luzon, the Philippines. *Elytra*, New Series, 9(2): 409 - 416.
121. Yoshitake H. 2020. A new species of the genus *Pachyrhynchus* Germar (Coleoptera, Curculionidae, Entiminae) from Southern Luzon, the Philippines. *Bulletin of the Kyushu University Museum*, 17: 109 - 114.
122. Yoshitake H. 2020. Additional records of *Metapocyrtus* (*Trachycyrtus*) *yonagunianus* Chujo (Coleoptera, Curculionidae, Entiminae) from the Okinawajima Islands in the central Ryukyus, southwestern Japan. *Elytra*, New Series, 10(1): 145 - 146.
123. Yoshitake H., Bollino M. 2019. Comments of distribution records of some *Pachyrhynchus* species (Coleoptera, Curculionidae, Entiminae). *Elytra*, Tokyo, New Series, 9(1): 181 - 182.
124. Yoshitake H., Bollino M., Sandel F. 2019. *Pachyrhynchus elenae* Rukmane, 2016, a new synonym of *Pachyrhynchus phaleratus* Waterhouse, 1841 (Coleoptera: Curculionidae: Entiminae). *Zootaxa*, 4585(1): 197 - 200.
125. Yoshitake H., Bollino M., Sandel F. 2019. Two new species of the genus *Pachyrhynchus* Germar, 1823 (Coleoptera, Curculionidae, Entiminae) from the Islands of Bohol and Mindanao in the Philippines. *Elytra*, Tokyo, New Series, 9(1): 183 - 191.
126. Yoshitake H., Tone K. 2020. Additional records of *Metapocyrtus* (*Trachycyrtus*) *adpersus* (Waterhouse) (Coleoptera, Curculionidae, Entiminae) from Okinawajima Island, the Ryukyus, Japan. *Elytra*, New Series, 10(1): 240 - 240.
127. Yoshitake H., Tsuchiya T. 2020. *Pachyrhynchus infernalis* Fairmaire (Coleoptera, Curculionidae, Entiminae) collected on Kumejima Island in the central Ryukyus, Japan. *Elytra*, New Series, 10(1): 218 - 218.
128. Yoshitake H., Tsuji N. 2019. Occurrence of *Metapocyrtus* (*Trachycyrtus*) *adpersus* (Waterhouse) (Coleoptera, Curculionidae, Entiminae) in Japan and Singapore. *Elytra*, Tokyo, New Series, 9(1): 177 - 179.
129. Yoshitake H., Yap S. A. 2017. Four *Pachyrhynchini* weevils exhibiting allopatric convergence in color and markings, with descriptions of three new taxa from Luzon, the Philippines. *Elytra*, Tokyo, New series, 7(2): 331 - 341.

Daugavpils University  
Institute of Life Science and Technology  
Department of Biodiversity  
Coleopterological research Centre

**Anita Rukmane-Bārbale**

**GENUS *PACHYRHYNCHUS* GERMAR, 1824 (COLEOPTERA: CURCULIONIDAE:  
PACHYRHYNCHNI) FAUNA, SYSTEMATICS AND BIOGEOGRAPHY IN  
ORIENTALAL REGION**

Thesis summary for the degree of Doctor of Science (*Ph. D.*)

In natural sciences (biology branch, zoology sub-branch)

Scientific leader:

Dr. biol., prof. Arvīds Barševskis

Daugavpils, 2023

The doctoral thesis was developed at the Coleopterological Research Centre of Daugavpils University, in the period from 2014 to 2023.



DAUGAVPILS  
UNIVERSITĀTE

NACIONĀLAIS  
ATTĪSTĪBAS  
PLĀNS 2020



EIROPAS SAVIENĪBA

Eiropas Sociālais  
fonds

I E G U L D Ī J U M S T A V Ā N Ā K O T N Ē

In the period from 02.2018. until 11.2018. co-financing of the Daugavpils University research grant **“New methods on the study of the genus Pachyrhynchus Germar, 1824, including DNA barcoding, as a new leading strategy to eliminate species”** was used for development of the doctoral thesis.

In the period from 02.2019. until 11.2019. the co-financing of the Daugavpils University research grant **“Systematic research of the genus Pachyrhynchus Germar, 1824”** was used for development of the doctoral thesis.

10.2019. the SYNTHESYS+ grant was used for the exchange of experience in the collections of the Hungarian National Museum of Nature and History (Budapest, Hungary).

Exchange of experience in natural museum in Dresden, Paris, London as well as expeditions for material collection were implemented using Erasmus+ personal training funding.

Thesis has been developed with the support of the European Social Fund in the project “Strengthening the professional competence of the academic staff of strategic specialization areas of Daugavpils University, round 3”. Agreement No. 8.2.2.0/20/I/003.

**Nature of the work:** doctoral thesis (a set of publications) in the field of biology, sub-field zoology.

**Scientific leader:** Dr. biol., prof. **Arvīds Barševskis**

**Reviewers:**

1. Dr.hab.inž. Paweł Sienkiewicz (Poznan University of Life Sciences);
2. Dr.biol., Prof., Artūrs Škute (Daugavpils University);
3. Dr.biol. Mārtiņš Kalniņš (JSC “Latvia’s State Forests”)

**Chairman of the Promotion Board:** Dr. biol., prof. **Inese Kokina**

**Thesis defense will take place:** Open session of the Daugavpils University Board of Promotion of field Biology, 16<sup>th</sup> February 2024., 13:00, Parādes street 1A, room 130, as well as online trough ZOOM platform.

The thesis and its summary can be found in the Daugavpils University library, Parades Street 1, Daugavpils (Latvia) and on the Daugavpils University website [www.du.lv](http://www.du.lv)

## CONTENTS

INTRODUCTION.....	38
Relevance of the study.....	38
Novelty of research, hypothesis, theses.....	39
Work purpose and tasks.....	40
WORK RESULT PUBLICATION.....	41
LITERATURE REVIEW	
Historical research of fauna of the genus <i>Pachyrhynchus</i> Germar, 1824.....	45
MATERIAL AND METHODS	
Field research methods.....	48
Laboratory research methods.....	48
MATERIAL EXAMINED.....	50
RESULTS AND DISCUSSION	
Review of the fauna of the tribe Pachyrhynchini of the Oriental region.....	51
Pachyrhynchini Schoenherr, 1826, <i>Apocyrtidius</i> Heller, 1908, <i>Apocyrtus</i> Erichson, 1834.....	51
<i>Enoplocyrtus</i> Yoshitake, 2017, <i>Eumacrocyrtus</i> Schultzze, 1924, <i>Eupachyrrhynchus</i> Heller, 1912, <i>Exnothapocyrtus</i> Schultzze, 1924.....	52
<i>Expachyrhynchus</i> Yoshitake, 2013, <i>Homalocyrtus</i> Heller, 1912, <i>Macrocyrtus</i> Heller, 1912.....	53
<i>Metapocyrtus</i> Heller, 1912, <i>Nothapocyrtus</i> Heller, 1912, <i>Pantorhytes</i> Faust, 1892.....	54
<i>Proapocyrtus</i> Schultzze, 1918, <i>Pseudapocyrtus</i> Heller, 1912, <i>Sphenomorpha</i> Behrens, 1887, <i>Trichomacrocyrtus</i> Yoshitake, 2018.....	55
Genus <i>Pachyrhynchus</i> Germar, 1824	
<i>Pachyrhynchus</i> Germar, 1824 zoogeography in oriental region.....	56
Analyses of morphological characters and genitalia.....	57
The new taxons of the tribe Pachyrhynchini.....	58
CONCLUSIONS.....	59
REFERENCES.....	61

## INTRODUCTION

### RELEVANCE OF THE STUDY

Weevils of the genus *Pachyrhynchus* Germar, 1824 (Curculionidae Latreille, 1802) represent one of the largest genera of the tribe Pachyrhynchini, order of beetles (Coleoptera) in the Oriental region. Most species inhabit the islands of the Philippine archipelago, with only 12 species outside the archipelago from islands of Taiwan and Indonesia. In the Oriental fauna, 641 species are known in the tribe Pachyrhynchini, 173 of which are represented by the genus *Pachyrhynchus* [2]. Members of the genus are found mainly in mountainous tropical forest habitats, with altitudes from 700m to 2400m above sea level. Larvae of the species living on the islands of Taiwan develop in the roots of trees, but little is known about the lifestyle of the larvae of the Philippine and Indonesian species. Members of the genus have been found on the leaves of several native and invasive plants, but precise information on the biology of the species is unknown. Although common species of the genus *Metapocyrtus* Heller, 1912: *Metapocyrtus (Trachycyrtus) hederaphilus* Yoshitake, 2012 is considered as agricultural pest, individuals of the genus *Pachyrhynchus* have been observed rather rarely and in small number to cause significant damage to plant crops.

Rapid clear-cutting of primary forest and forest land replacement with agricultural crop fields in the Philippine archipelago is the reason why many authors [8, 14, 16, 17] have raised the question of need to protect the species. Species are mostly endemic and, in some cases, can be found only in one specific mountain, for example *P. apoensis* Yoshitake, 2012 which is found only on Mount Apo. Therefore, complete destruction of the forest area would also mean the potential extinction of the species. Additionally, members of the tribe are widely represented in private and natural museum collections and are a popular sale object on well-known websites such as ebay and amazon. The interest of collectors in rare specimens encourages the desire of collectors to earn money and violate the ban on specimen collection in specially protected areas, because of which specimens are collected in masse and total number of populations decrease.

Due to above-mentioned factors, accurate, timely identification of the species is of particular importance. It is necessary to audit the composition of the local fauna of weevils, which would serve as an educational material for environmental protection, biology agricultural specialists, teachers and students, entomologists, ecologists as well as local residents. Weevils are an integral part of every terrestrial habitat, the loss of their diversity can have incalculable consequences.

Studies on the genus *Pachyrhynchus* have become a hot topic among entomologists around the world. With the first 21st century research on taxonomy of the genus in 2012, local Philippine and number of foreign researchers from Taiwan, Italy, Japan, Canada, and Latvia have focused on the study resulting increase of number of the species within the genus by 87. Insufficient data on the Philippine weevils, high biodiversity and risk of extinction were the determining factors in selection of the research object. The original distribution data were considered as old (dated back to start of 20th century for most of the species) and insufficient to complete the overall geographic affinities, distribution, and abundance of the genus. Taxonomic status of part of the available material was also unclear, consequently, study on bibliographic data and museum collection material was carried out. Using actual research methods, extensive coleopterological material was collected and processed during the research, a list of species of the Oriental region corresponding to modern systematics was created and many taxonomic problems were solved, resulting in description of new taxa.

## NOVELTY OF RESEARCH

During the research, all available scientific literature on the species of the tribe Pachyrhynchini of the Oriental region was collected and analysed, covering bibliographical sources since 1821. Original and previously unpublished faunistic data from Daugavpils University Beetle Collection as well as nine foreign Natural History Museum collections are used for this particular research, data include majority of types material. During the research, number, and composition of species of the genus *Pachyrhynchus* was established. Currently, 173 species of the genus *Pachyrhynchus* have been found in the fauna of Oriental region and for the largest part new localities and additional distribution range is reported. Based on modern concepts in beetle systematics, an annotated systematic catalogue of weevils of the genus *Pachyrhynchus* of the Oriental region was compiled and published, catalogue include species synonyms, bibliographic references, species distribution range and information on holotype. Faunistic data were analysed and clarified, which significantly expands the picture of the variety, occurrence, and distribution of fauna. It will be possible to use the obtained data to clarify the species composition at protected natural areas. Using modern microscopy methods, morphological characteristics such as shape and structure of genitalia, including characteristics of endophallus for closely related taxa were systematically analysed and compared. 37 species and four subspecies of the genus *Pachyrhynchus* were described as new to science. In addition, four species of the genus *Eupachyrhynchus*, two species of the genus *Trichomacrocyrthus*, three species of the genus *Macrocyrthus*, one species of the genus *Expachyrhynchus*, two species of the genus *Pseudapocyrthus* and one species of the genus *Apocyrthus* were described as new to science within the tribe Pachyrhynchini. As part of the research, a standard collection of the genus *Pachyrhynchus* was created in the Daugavpils University Beetle Collection. Work continues identifying and supplementing the collection material of tribe, focusing on the genus *Metapocyrthus*. In terms of the number of species and specimens represented, Daugavpils University Beetle Collection is now one of the largest in the world, with significant number of type material.

## HYPOTHESIS

Study on the fauna, systematics, biogeography, and external morphological and genital structures of the genus *Pachyrhynchus* of the Oriental region will lead to increased number of species, the taxonomic status, occurrence, distribution, and diversity of the species will be specified.

## THESES

The first information on the fauna of the genus *Pachyrhynchus* was published in 1824 and since 2012, intensive systematic studies have resumed. Considering the large amount of material found in the less-explored provinces of the Philippine archipelago, new species of weevils can still be found, and distribution can be clarified for most of the species.

During the past 10 years, total number of species in the genus has doubled, as well as several synonyms of species have been established. Some of the species according to literature have been wrongly identified, consequently, list of the species of the genus *Pachyrhynchus* must be revised.

Using modern microscopy research methods, it is possible to solve the identification problems for most of systematically close and hard-to-identify species.

Analysis of the distribution of species of the genus *Pachyrhynchus* in the Oriental region provides new information for biogeographical structure of the species.

## **WORK PURPOSE AND TASKS**

**Purpose of the doctoral thesis:** To conduct a study of the fauna, systematics, and biogeography of the genus *Pachyrhynchus* Germar, 1824 in the Oriental region as well as to find out the essential and practical features for the identification of the taxa of the genus.

The following tasks have been set to achieve the goal of the work:

- Process the material available at DUBC and largest museum collections as well as the material obtained during expeditions to Philippine archipelago, creating standard collection of the genus *Pachyrhynchus*;
- Clarify the species composition of the fauna of the genus *Pachyrhynchus* and compile a systematic, annotated catalogue of the species;
- Find out and clarify the distribution and occurrence of taxa in the Oriental region.
- Analyse the external morphological features and structures of the genitalia, including endophallus, their use in taxon identification.



## WORK RESULT PUBLICATION

### Doctoral thesis – a set of publications based on 27 published scientific articles in international peer-reviewed journals:

1. Rukmane A., Barševskis A. 2016. Nine new species of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae) from the Philippines. *Baltic Journal of Coleopterology*, 16(1): 77 - 96.
2. Rukmane A. 2016. Six new species of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae) from the Philippines. *Acta Biologica Universitatis Daugavpiliensis*, 16(1): 81 - 92.
3. Cabras A. A., Rukmane A. 2016. A new species of *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Entiminae). *Acta Biologica Universitatis Daugavpiliensis*, 16(1): 123 - 127.
4. Cabras A., Cortico F., Mohagan A. B., Rukmane A. 2017. Diversity of Pachyrhynchini (Coleoptera: Curculionidae: Entiminae) in Mt. Kiamo, Malaybalay, Bukidnon, Mindanao, Philippines. *Journal of Entomology and Zoology studies*, 5(3): 979 - 983.
5. Rukmane A. 2017. New species of the genus *Pachyrhynchus* Germar (Coleoptera, Curculionidae, Entiminae) from greater Mindanao Pleistocene Aggregate island complex (Philippines). *Acta Biologica Universitatis Daugavpiliensis*, 17(1): 85 - 95.
6. Bollino M., Sandel F., Rukmane A. 2017. New species of the genus *Pachyrhynchus* Germar, 1823 (Coleoptera: Curculionidae) from Mindanao, Philippines. *Baltic Journal of Coleopterology*, 17(2): 189 - 204.
7. Rukmane A., Cabras A. 2018a. New and additional notes on the distribution of *Pachyrhynchus mollendorffi* Heller, 1899 (Coleoptera, Curculionidae), with description of new taxon from the Marinduque Island (Philippines). *Baltic Journal of Coleopterology*, 18(2): 57 - 63.
8. Rukmane A., Cabras A. 2018b. Three new species of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae) from Panay Island, Philippines. *Baltic Journal of Coleopterology*, 18(1): 65 - 76.
9. Rukmane A. 2018a. An annotated checklist of genus *Pachyrhynchus* (Coleoptera: Curculionidae: Pachyrhynchini). *Acta Biologica Universitatis Daugavpiliensis*, 18(1): 63 - 68.
10. Rukmane A. 2018b. Checklist of *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) species of ZMUC (Natural History Museum of Denmark, University of Copenhagen). *Acta Biologica Universitatis Daugavpiliensis*, 18(2): 225 - 228.
11. Rukmane A. 2018c. To the knowledge of *Pachyrhynchus croesus* Oberthur, 1879 (Coleoptera: Curculionidae) species distribution and biogeography. *Acta Biologica Universitatis Daugavpiliensis*, 18(2): 229 - 232.
12. Rukmane A. 2018d. To the knowledge of *Pachyrhynchus moniliferus* Germar, 1824 (Coleoptera: Curculionidae) species distribution and biogeography with description of two new subspecies from Philippines. *Acta Biologica Universitatis Daugavpiliensis*, 18(2): 233 - 242.
13. Rukmane A. 2018e. One new species of genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) from Philippines. *Baltic Journal of Coleopterology*, 18(2): 193 - 198.
14. Rukmane A. 2018f. Two new species of genus *Pachyrhynchus* (Coleoptera: Curculionidae: Pachyrhynchini) from Mindanao, Philippines. *Baltic Journal of Coleopterology*, 18(2): 283 - 290.
15. Rukmane A. 2019a. To the knowledge of genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) species from SMNH (Stockholm, Sweden) with description of a new species from the Sibuyan Island (Philippines). *Baltic Journal of Coleopterology*, 19(1): 41 - 50.

16. Rukmane A. 2019b. To the knowledge on the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini), corrections and additions on the *Pachyrhynchus speciosus* species group. *Acta Biologica Universitatis Daugavpiliensis*, 19(2): 253 - 260.
17. Rukmane A. 2019c. To the knowledge of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) species from HUF (Budapest, Hungary), with description of a new species from the Mindanao Island (Philippines). *Acta Biologica Universitatis Daugavpiliensis*, 19(2): 267 - 272.
18. Rukmane A. 2019d. Four new species and two subspecies of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) from Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 19(2): 141 - 150.
19. Bollino M., Rukmane A., Mohagan N. 2020. Two new *Pachyrhynchus* (Curculionidae: Entiminae: Pachyrhynchini) from Misamis Occidental (Mindanao, The Philippines). *Zootaxa*, 4852(3): 323 - 332.
20. Rukmane-Bārbale A. 2020a. A new synonym of *Pachyrhynchus speciosus* Waterhouse, 1841 (Coleoptera: Curculionidae) from the Philippines. *Acta Biologica Universitatis Daugavpiliensis*, 20(1): 35 - 38.
21. Rukmane-Bārbale A. 2020b. Short contribution to distribution and appearance of *Pachyrhynchus decussatus* Waterhouse, 1841 (Entiminae: Pachyrhynchini) with description of one new taxon from Catanduanes Island, Philippines. *Baltic Journal of Coleopterology*, 20(1): 81 - 85.
22. Rukmane-Bārbale A. 2020c. To the knowledge of some closely related species of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) from Luzon Island (Philippines), with usage of eversion of endophallus. *Acta Biologica Universitatis Daugavpiliensis*, 20(2): 133 - 139.
23. Rukmane-Bārbale A. 2020d. Two new species of the genus *Pachyrhynchus* Germar, 1824 (Curculionidae: Entiminae: Pachyrhynchini) from Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 20(2): 179 - 184.
24. Rukmane-Bārbale A., Cabras A. A. 2021. Updated distribution of *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Entiminae) from the Philippines with biogeographic affinities. *Baltic Journal of Coleopterology*, 21(2): 199 - 211.
25. Cabras A. A., Medina M. N. D., Torrejos C., Pajota E. L., Pepito M. J., Ceballos R., Rukmane A. 2022. Annotated list of Pachyrhynchini (Coleoptera, Curculionidae, Entiminae) in Davao City, Mindanao, Philippines. *CheckList*, 18(4): 799 - 814.
26. Rukmane-Bārbale A. 2022. New species of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) from the Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 22(2): 433 - 436.
27. Patano Jr. R. R., Amoroso V. B., Cortico F. P., Cleofe C. M. B., Rukmane-Bārbale A. 2022. *Pachyrhynchus cebrem* sp. nov.: A new species of easter egg weevil (Curculionidae: Entiminae: Pachyrhynchini) from Davao De Oro, the Philippines. *Philippine Journal of Systematic Biology*, 16(1): 50 - 53.

## 9 scientific publications published within the tribe Pachyrhynchini:

1. Rukmane A. 2019. A new species of the genus *Expachyrhynchus* Yoshitake, 2013 (Coleoptera: Curculionidae: Pachyrhynchini) from Palawan Island, Philippines. *Baltic Journal of Coleopterology*, 19(1): 35 - 40.

2. Rukmane A. 2019. One new species of the genus *Macrocyrtus* Heller, 1912 (Coleoptera: Curculionidae: Pachyrhynchini) from Luzon Island, Philippines. *Acta Biologica Universitatis Daugavpiliensis*, 19(1): 37 - 40.
3. Rukmane A. 2019. Two new species of the genus *Macrocyrtus* subgenus *exmacrocyrtus* Schultze, 1924 (Coleoptera: Curculionidae: Entiminae) from Luzon Island, Philippines. *Acta Biologica Universitatis Daugavpiliensis*, 19(2): 261 - 266.
4. Rukmane A. 2019. One new species of the genus *Trichomacrocyrtus* Yoshitake, 2018 (Coleoptera: Curculionidae: Entiminae) from Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 19(2): 159 - 162.
5. Rukmane A. 2019. Four new species of the genus *Eupachyrhynchus* Heller, 1912 (Coleoptera: Curculionidae: Entiminae) from Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 19(2): 151 - 158.
6. Rukmane-Bārbale A. 2021. To the knowledge of the genus *Apocyrtus* Erichson, 1834 (Coleoptera: Curculionidae: Pachyrhynchini) with description of new species from Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 21(2): 181 - 188.
7. Rukmane-Bārbale A. 2021. Two new species of the genus *Pseudapocyrtus* Heller, 1912 (Coleoptera: Curculionidae: Pachyrhynchini) from Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 21(2): 189 - 198.
8. Rukmane-Bārbale A. 2022. A new species of the genus *Trichomacrocyrtus* Yoshitake, 2018 (Curculionidae: Entiminae: Pachyrhynchini) from Luzon Island, Philippines. *Baltic Journal of Coleopterology*, 22(2): 437 - 441.
9. Rukmane-Bārbale A. 2022. A new species of the genus *Apocyrtus* Erichson, 1834 (Coleoptera: Curculionidae: Pachyrhynchini) from the Marinduque Island, Philippines. *Baltic Journal of Coleopterology*, 22(2): 429 - 432.

**Reports on the main results of the doctoral thesis have been presented at 7 international scientific conferences:**

8. Rukmane A., Barševskis A. To the knowledge of *Pachyrhynchus orbifer* Waterhouse, 1841 (Coleoptera: Curculionidae) species fauna, distribution and biogeography. ИТОГИ И ПЕРСПЕКТИВЫ РАЗВИТИЯ ЭНТОМОЛОГИИ В ВОСТОЧНОЙ ЕВРОПЕ. Minsk, Belarus. 6 - 8. 09. 2017. Oral presentation.
9. Rukmane A., Barševskis A. The genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae) fauna, biogeography, mimicry and place in landscape protection. 9th international conference on biodiversity research. Daugavpils, Latvia. 26 - 28. 04. 2017. Poster.
10. Rukmane A. The place of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae) in landscape protection. Scientific International Conference Problems of Landscape Protection and Management in XXI century. Warsaw, Poland. 20 - 22. 04. 2017. Poster.
11. Rukmane A. DNA Barcoding as additional method for species description. Example on genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae). II Conference of Young Scientists. Warsaw, Poland. 25 - 26. 05. 2017. Oral presentation.
12. Rukmane A. New species of the genus *Pachyrhynchus* Germar, 1824 (Coleoptera: Curculionidae: Pachyrhynchini) from the Greater Mindanao PAIC (Philippines). 10th international conference on biodiversity research. Daugavpils, Latvia. 24 - 26. 04. 2019. Poster.
13. Rukmane A. New and additional knowledge on the genus *Pachyrhynchus* Germar, 1824. 1st UM National Congress and 1st Scientific Meeting of the Philippine Coleopterological Network (PhilColNet). Davao, Philippines. 27 - 28. 04. 2019. Oral presentation.

14. Rukmane A. Diversity of the genus *Pachyrhynchus* Germar, 1824 in the Oriental region. 7<sup>th</sup> meeting of Baltic coleopterologists. Olszryn, Poland. 20 – 23. 06. 2023. Oral presentation.

## LITERATURE REVIEW

### HISTORICAL RESEARCH OF FAUNA OF THE GENUS *PACHYRHYNCHUS* GERMAR, 1824

In less than 200 years, the fauna of weevils of the genus *Pachyrhynchus* has been studied by entomologists from Germany, England, Austria, Japan, Philippines, Latvia and other countries, however, most of the studies are fragmentary.

The first species of the genus *Pachyrhynchus* was published in 1824 in the work of German entomologist Germar [47]. Only one species of the genus *Pachyrhynchus* is described in the monograph: *P. moniliferus* Germar, 1824. In 1826, the genus *Pachyrhynchus* was systematized under the newly described tribe Pachyrhynchini, discovered by German entomologist Schoenher [80].

In 1839, French entomologists Eydoux and Soulayet [39] published a description of *P. chevrolati*, the taxonomic status of the species was later changed: *P. moniliferus* ssp. *chevrolati*.

English entomologist Waterhouse described 18 species and one subspecies in his 1841 monograph: *P. orbifer*, *P. phaleratus*, *P. decusstus*, *P. roseomaculatus*, *P. rugicollis*, *P. jugifer*, *P. reticulatus*, *P. speciosus*, *P. schoenherri*, *P. erichsoni*, *P. erichsoni* ssp. *eschsoltzi*, *P. venustus*, *P. multipunctatus*, *P. gemmatus*, *P. cumingi*, *P. perpulcher*, *P. latifasciatus*, *P. rufopunctatus*, *P. elefans*. Two species included in the monograph are recognized as synonyms of *P. moniliferus* Germar, 1824: =*P. concinnus*, =*P. chlorolineatus*, as well as a synonym of *P. roseomaculatus*: =*P. striatus*. Author published additional research on the tribe in 1853 monograph [96, 97]. Entomological material was obtained from Cuming's expedition to the islands of the Philippine archipelago. The material collected by Cuming was studied in parallel by the French entomologist Chevrolat, who published the results of the research in the same year, most of the described species are classified as synonyms of the species described by Waterhouse: *P. orbifer* Waterhouse, 1841 =*P. fimbriatus*, *P. glubulipennis*, *P. pretiosus*, *P. scintillans*, *P. alboguttatus*; *P. moniliferus* Germar, 1824 = *P. confinis*; *P. jugifer* Waterhouse, 1841 = *P. phodopterus*. One subspecies is recognized as valid: *P. orbifer* ssp. *gemmans*. Chevrolat published a continuation of his research in 1879 describing *P. viridis*, and in 1881 describing two species and one synonym: *P. annulatus*; *P. lorquini*; *P. congestus* Pascoe, 1871 = *P. luteoguttatus* Chevrolat, 1881 [32, 33, 34].

In 1845, Swedish entomologist Schoenherr published a description of *P. fahrei*, which was later synonymized as a synonym of *P. orbifer* Waterhouse, 1841 [81].

In 1864, the Dutch entomologist Snellen van Vollenhoven focused on the research of the genus, publishing the first species outside the Philippine archipelago, from the Island of Indonesia: *P. morotaiensis* (Morotai), *P. forsteni* (Ternate, Halmahera) [91]. In 1879, French entomologist Oberthur [72] published description of *P. croesus* from Sanghir Island. In 1897, French entomologist Fairmaire published description of *P. infernalis* from Ishigahi-Sima Island [41]. In 1927, Japanese entomologist Sakaguchi published a description of *P. niger* which was later recognized as a synonym of *P. infernalis* Fairmaire [78].

In 1871, English entomologist Pascoe [74] published description of four new species: *P. argus*, *P. congestus*, *P. inelytus*, *P. pinorum*. All species were described from Luzon Island.

In 1887, German entomologist Behrens published description of eight new species: *P. annulatus*, *P. dohrni*, *P. pulchellus*, *P. sarcitis*, *P. smaragdinus*, *P. venustus*, two of the species were recognized as synonyms: *P. chlorites* Chevrolat, 1881 = *P. rutilans*; *P. inelytus* Pascoe, 1873 = *P. modestior* [3].

In 1888, German entomologist Kraatz published description of three new species and two subspecies, but all of the described species was recognized as synonyms: *P. congestus* Pascoe, 1873 = *P.*

*immarginatus*; *P. lorquini* Chevrolat, 1881 = *P. plavopunctatus*, = *P. flavomaculatus*. Discovered subspecies: *P. congestus* ssp. *caerulans*, *P. gemmatus* ssp. *purpureus* [63].

In 1895, German entomologist Faust published description of two new species, one of which was recognized as synonym: *P. morotaiensis* Volh. 1864 = *P. waterhousei* and *P. gloriosus* Faust, 1895 [43].

Austrian entomologist Heller is one of the most recognizable researchers of the tribe Pachyrhynchini. The author described six genera of the tribe, one in 1908: *Apocyrtidius* Heller, 1908; and five in 1912: *Eupachyrrhynchus*, *Macrocyrtus*, *Metapocyrtus*, *Nothapocyrtus*, *Pseudapocyrtus*. The author first published results of the research on the genus *Pachyrhynchus* in 1899, publishing description of *P. moellendorffi*. Most significant work of the author is the monograph of 1912, in which, in addition to 14 new species, two subspecies and one synonym, first data on the biology of the species as well as attempt to split species into species groups is published. Taxa described in 1912: *P. abranus*, *P. annelifer*, *P. circulatus*, *P. eques*, *P. lacunosus*, *P. moniliferus* ssp. *stellulifer*, *P. morio*, *P. nobilis*, *P. ochroplagiatus*, *P. pinorum* ssp. *transversalis*, *P. psittacinus*, *P. sanchezi*, *P. semperi*, *P. stellio*, *P. tristis*, *P. viridans*. *P. multipunctatus* Waterhouse, 1841 = *P. auroguttatus* Heller, 1912. In 1921, author published description of three new species and one subspecies, two of the species are recognized as synonyms: *P. congestus* ssp. *pavonius*; *P. inclytus* Pascoe, 1873 = *P. modestior* var. *transversatus*; *P. lorquini* Chevrolat, 1881 = *P. bakeri*; *P. psittaculus*. In 1923, a description of *P. basilanus* was published, which was the first and currently the only known species from Basilan Island. In 1929, description of three new species was published: *P. cagayanus*, *P. disgestus*, *P. equester* [48, 49, 50, 51, 52, 53]. In 1914 Kuntzen published description of *P. helleri*, dedicated to the Heller in honour of his work on the tribe Pachyrhynchini [64].

The work on representatives of the genus distributed on the island of Taiwan was done by Taiwanese entomologist Kono, publishing the first study in 1929 [61], describing four new species: *P. insularis*, *P. yamianus* un *P. tobafolius*, *P. sarcitis*. In 1936, Taiwanese entomologist Kano published a comprehensive biogeographic survey including the first records from the Babuyan Islands. In 1942 [62] Kono published description of the genus *Kotoshozo*, which was recognized as a synonym of the genus *Pachyrhynchus*, additionally, description of one new species: *P. sonani* [60].

German entomologist Schultze carried out the most extensive research on the genus. In 1916, author published a catalogue of the tribe, collecting all literary sources and species deposits. In 1917, five new species from Luzon Island was described: *P. igorota*, *P. loheri*, *P. schultzei*, *P. sumptuosus*, *P. zebra*. In 1919, description of two new species was published: *P. signatus*, *P. ardentius*; and one subspecies: *P. venustus* ssp. *insulanus*; two species was recognized as synonyms: *P. speciosus* Waterhouse = *P. absurdus*, *P. venustus* Waterhouse = *P. virgatus*. In 1920, author published description of *P. erosus*. In 1922, description of 17 new taxa was published: *P. amabilis*, *P. apicatus*, *P. apocyrtoides*, *P. atrocyaneus*, *P. buccasanus*, *P. chamissoi*, *P. consobrinus*, *P. corpulentus*, *P. dubiosus*, *P. halconensis*, *P. pseudoproteus*, *P. postpubescens*, *P. regius*, *P. semiignitus*, *P. signaticollis*, *P. sulphureomaculatus*, *P. taylori*; two subspecies: *P. gloriosus* ssp. *abbreviatus*, *P. orbifer* ssp. *azureus*. In 1923, description of five new species was published: *P. confusus*, *P. cruciatus*, *P. libucanus*, *P. samarensis*, *P. sphaericollaris* together with the largest monograph to date, which included the taxonomic review, distribution, and extensive description of the biology of the genus. In 1924, descriptions of three new species were published: *P. baluganus*, *P. benguetanus*, *P. negrosensis*; and two subspecies: *P. congestus* ssp. *ocellatus*, *P. taylori* ssp. *metalescens*. In 1925, author published extensive distributional data and in 1934 description of three new species were published: *P. davaoensis*, *P. galeraensis*, *P. rizali*; one subspecies: *P. buccasanus* ssp. *ornatus* [82, 83, 84, 85, 86, 87, 88, 89, 90, 91].

The taxonomic work on the genus was resumed in 2012, when Japanese entomologist Yoshitake published description of nine new species: *P. apoensis*, *P. caeruleovittatus*, *P. hirokii*, *P. naokii*, *P.*

*pseudamabilis*, *P. sphenomorphoides*, *P. subamabilis*, *P. tadauchii*, *P. zamboanganus* [102]. Authos has done extensive work on both genus and tribe studies [45, 46, 99, 100, 102, 122, 126, 127, 128], as well as published new distribution data and information on species biology [111, 112, 113, 116, 118, 119, 123, 124, 127], but the most extensive is work on taxonomy of the tribe, with three new genera of the tribe Pachyrhynchini described [104, 109, 110] and 31 new species of the genus *Pachyrhynchus* [105]. In 2017, description of two new species were published: *P. callainimaculatus*, *P. conformis*, *P. gilvamaculatus*, *P. niisatoi*, *P. notocruciatus*, *P. sakaii*, *P. septentrionalis*, *P. sumptuosoides*, *P. obhayashii* [106, 107, 108] one of the species with Philippine entomologist S. Yap: *P. masatoshii* Yoshitake & Yap [129]; four subspecies: *P. orbifer* ssp. *striatamaculatus*, *P. orbifer* ssp. *callainus*, *P. congestus* ssp. *mirabilis*, *P. rukmanee* ssp. *paucisignatus*; one of the described species was recognized as synonymy: *P. rukmanee* Barševskis = *P. takakuwaii*. In 2018, description of one new subspecies was published: *P. multipunctatus* ssp. *endoi* [113]. In 2019, description of nine new species were published: *P. atronitens*, *P. caeruleus*, *P. circummaculatus*, *P. florulentus*, *P. maruyama*, *P. naokae*, *P. noeli*, *P. yucae*, *P. yuukae*; one subspecies: *P. phaleratus* ssp. *badiovittatus* [114, 115, 117, 120]; two species were published together with Italian entomologists Bollino and Sandel: *P. octoannulatus*, *P. yoshitakeorum* Yoshitake, Bollino & Sandel [125]. In 2020, description of one new species was published: *P. rochaorum* [121].

Italian entomologists Bollino and Sandel have also focused on taxonomic research of the genus, publishing the first study in 2015, the study includes descriptions of three new species: *P. mohagani*, *P. lubanganus*, *P. tilikinesis* [9] from Lubang Island, that is also the first record of *Pachyrhynchus* from the current island. Authors are the first to use the male genital sac inflation method to distinguish closely related taxa. Although most of the authors works are devoted to the taxonomy of the genus *Metapocyrtus*, [6, 7, 10, 11, 12, 13, 79] the authors also re-introduced the division of species of the genus *Pachyrhynchus* into species groups with a common set of morphological features. A similar method of division was used by Heller and Schultze. In 2017, descriptions of two species groups together with description of two new species were published: *P. banglas*, *P. esperanza* Bollino, Sandel & Rukmane.

A group of Taiwanese entomologists in lead of Tseng has conducted research on the biology and ethology of species of the genus *Pachyrhynchus* species from islands of Taiwan [30, 55, 56, 68, 69], as well as description of one new species [31]. Researchers have conducted extensive research on the biology of the species from Babuyan Island group [96, 101].

Valuable contribution to tribal research has been made by local Philippine scientists in lead of Mohagan. A group of researchers from the Central Mindanao University focused on the taxonomy of the genus *Metapocyrtus* [75, 76, 77] as well as biology and distribution analysis of the tribe Pachyrhynchini [70, 71].

One of the major contributions to the biology, ecology and taxonomy of the tribe has been made by researchers from University of Mindanao Coleopterological Research Center in lead of Medina and Cabras. Researchers has published descriptions of 25 new species of the genus *Metapocyrtus* [8, 15, 16, 17, 18, 19, 20, 21, 22, 24, 26, 27, 28, 29], and two new species of the genus *Pachyrhynchus*: *P. miltoni* Cabras & Rukmane, *P. obumanuvu* Cabras & Medina [23]. Focus is also on evolutionary study of the tribe [35, 36, 73], and ecology and distribution [14, 25].

## **MATERIAL AND METHODS**

### **FIELD RESEARCH METHODS**

#### **1. Collecting with an entomological net.**

By funding provided by ERASMUS+, in the months of March – May 2018, 2019, 2020 and 2023, expeditions to the Island of Mindanao of the Philippine archipelago were organised. Individuals of the target group were collected in their natural habitat. Collection with an entomological net is the basic method for collection phytophagous beetles. Weevils of the target group stay on leaf plates or crawl on tree trunks shortly after sunrise and before the sunset, while during the how daytime they tend to hide under the leaf plates. Their main defensive response is to fall to the ground when they are threatened. Using the entomological net, it is possible to catch the beetle as it falls, as well as to reach the higher tree branches to safely collect the individual. Most of the material were collected using this method.

#### **2. Shaking of the branches of these or bushes**

The specific method can be used for shrubs or small trees. A white cloth is placed under the plant and the branches of the tree / shrub are shaken until the weevils fall and can be collected by hand. The specific method is effective for collecting many background species, but according to observations, rarer species more often stay on the top of tall trees, where it is impossible to apply the given method.

#### **3. Visual observation of the biotope**

3.1. Visual observation of the plants.

3.2. Visual observation of the soil.

Method will be effective in combination with an entomological net. The beetles are identified and then carefully collected using an entomological net.

### **LABORATORY RESEARCH METHODS**

#### **1. Mounting and storage of the material.**

The raw material collected during the expeditions, as well as material from the Daugavpils University Beetle Collection was assembled in accordance with the requirements for design of entomological collections. Weevil imago specimens were soaked in boiling water, flattened and glued with PVA glue on cardboard of the appropriate size. Cardboards later were stuck on entomological needles of the appropriate thickness. A mounting block was used to ensure the same level. Each specimen was accompanied by a white, square printed label with the collection site, the date and name of the collector. Another rectangle label with species name was pinned underneath. A red, rectangle label was added to type species including information of species name, author, and finder.

#### **2. Material dissection.**

Male and female genitalia were dissected for all species included in the study. The shape of both male penis and female spermatheca was analysed. For problematically identifiable taxa, the structure of male inner sac (endophallus) was studied. Before dissection, the specimen was soaked in boiling water until



its tissues became soft. Entomological needles with a curved tip were used to dissect the genitalia. Before inflating the endophallus, the aedeagus was soaked in 10% KOH solution for at least an hour. Soaked aedeagus was rinsed in water to remove residual KOH. The base of the aedeagus was pinned onto a syringe of the appropriate size, the paramere was pulled down, the apodeme and the body of the aedeagus were tightly fixed to the syringe using parafilm and then inflated with water or toothpaste. In case of successful inflation, the preparation was immediately photographed to rule out the shape deformation with time.

### **3. Microscopy and photography.**

Nikon SMZ 745T digital stereo microscope with NIS Elements 6D software was used for morphological studies of individuals. Photographs were taken with a Canon MP-E 65mm macro lens. Images were captured in levels with the stack shot automatic height adjustment system, consistently assembled using Helicon Focus software and processed using Photoshop.

### **4. Determination of coleopterological material.**

For identification of the species were used original descriptions [3, 4, 9, 23, 32, 33, 34, 39, 40, 41, 42, 43, 47, 49, 50, 51, 53, 54, 62, 63, 64, 72, 74, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 96, 97, 98, 103, 106, 107, 108, 113, 114, 115, 117, 120, 121, 125, 129], with the following careful examination of specimens. Specialists of the group gave useful advices in determining of the coleopterological material: Bollino, Sandel, Cabras.

### **5. Systematics.**

Systematics of the taxa correspond M. A. Alonso-Zarazaga & C. H. C. Lyal [2], Agassiz L. [1], documentation of International Zoological Nomenclature [58, 59];

Annotated catalog of the genus *Pachyrhynchus* was created by summarising literature data on the tribe Pachyrhynchini with additional literature sources [5, 44, 54, 57, 65, 66, 67, 93, 94].

### **6. Description of the new taxa.**

The new taxon's after careful morphological examination was described and published. The species description include morphological description, information on type material, distribution data, differential analyses and etymology. For species, that were collected during the fieldwork, additional graph on species biology was added (*P. miltoni* and *P. cebrem*).

### **7. Distributional analyses**

Various literature sources were used, to analyse distribution and abundance of the species [14, 25, 31, 37, 42, 43, 52, 55, 56, 61, 70, 71, 72, 78, 89, 96, 101, 106, 107, 111, 112, 118, 123]. Literature data were compiled with information from entomological collections and expeditions. For analyses of biogeographical distribution, the nationally accepted division of regions and provinces was used.

## **MATERIAL EXAMINED**

As part of the work, an analysis of beetle collections containing material of the Pachyrhynchini tribe of the Oriental region were conducted. The following collections were processed within the scope of the study:

DUBC – Daugavpils University Beetle Collection, Daugavpils, Latvija

MTD – Museum of Zoology Senckenberg, Dresden, Germany

NHML – Natural History Museum, London, England

MNHN – National Museum of Natural History, Paris, France

SMNH – Swedish Museum of Natural History, Stockholm, Sweden

HNHM – Hungarian National History Museum, Budapest, Hungary

NHMD – Natural History Museum of Denmark, Copenhagen, Denmark

NHMB – Natural History Museum, Berlin, Germany

NMP – National Museum Prague, Prague, Czech Republic

MMBC – Moravian Museum Brno, Brno, Czech Republic

## RESULTS AND DISCUSSION

### REVIEW OF THE FAUNA OF THE TRIBE PACHYRHYNCHINI OF THE ORIENTAL REGION

#### **Pachyrhynchini Schoenherr, 1826**

= *Somatoides*: Schoenherr, 1823-1139; = *Pachyrhynchides* Schoenherr, 1826-88; = *Pachyrhynchoidae* Agassiz, 1846-270; = *Pachyrhynchini* Chevrolat, 1847-389; = *Pachyrhynchitae* Blanchard, 1853-201; = *Pachyrhynchidae* Waterhouse, 1853-201; = *Pachyrhynchini* Stein, 1868-100; = *Pachyrrhynchidae* Behrens, 1887-212; = *Pachyrhynchinae* Faust, 1892-193; = *Pachyrrhynchini* Heyne and Taschenberg, 1907-225; = *Pachyrrhynchinae* Heller, 1922-542; = *Pachyrhynchoidea* Ienistea, 1986-32

Pachyrhynchini is a tribe of weevils widely represented in the fauna of the Oriental region with 641 known species, divided into 17 genera.

Antenna curved downwards, contains of 11 segments; antennal scape lateral, curved downwards; thickness, location of apex of antennal scape in relation to inner or distal edge of the eye is an important feature in determination of genera: scape to inner edge of the eye / to medial portion of the eye / to distal edge of the eye / past the distal edge of the eye.

Adults with mandibles without grooves on other surface, evenly curved; apex of elytra rounded; base of elytra rounded; hind coxae even, within the edge of elytra.

#### ***Apocyrtidius* Heller, 1908-128**

One species within the genus: *Apocyrtidius chlorophanus* Heller, 1908. The only species of the tribe Pachyrhynchini that is known to be distributed on Borneo. The last known finding is known from Mesilau region.

Generic characters: short scape, with edge not reaching inner margin of the eye; antennae thick; eyes strongly globular, strongly curved outside the contour of the head; episternal suture present thick; segment IX of abdomen uneven; inner surface of tibia not flattened.

#### ***Apocryptus* Erichson, 1834-252**

= *Apocryptus* Chevrolat, 1841-226

Four species within the genus. Luzon Island: *A. mcgregori* Schultze, 1924, Negros Island: *A. chapmani* Schultze, 1934. Marinduque Island: *A. auroraensis* Rukmane-Bārbale, 2021. Based on collection data, new records of *A. inflatus* Erichson, 1834 from Marinduque and Pollilo Island was added to original distribution of Luzon Island.

Generic characters: rostrum dorsally with deep, straight cross groove, that separates base of the rostrum from head; eyes big, moderately curved outside the contour of the head; antennae thick, scape reaching distal edge of the eye; scutellum completely covered; I and II segments of abdomen completely connected; elytra and prothorax strongly curved. The new taxon differs from other species with strongly curved elytra in both sexes, that are covered with green, separate scales. Structure of elytra strongly roughed.

### ***Enoplocyrtus* Yoshitake, 2017**

One species within the genus: *E. marusan* Yoshitake, 2017 known from Luzon Island.

Generic characters: rostrum dorsally without cross-groove, straight, lateral edges along scape with triangular-shaped impression; front tibia flattened, with wedge-shaped growth on outer margin; hind tibia without growths on inner margin; eyes small, not curved outside the contour of the head.

### ***Eumacrocyrtus* Schultze, 1924-599**

One species within the genus: *E. canlaonensis* Schultze, 1923 distributed at Negros Island.

Generic characters: body flattened; dorsally elytra weakly curved, prothorax straight; elytra of lanceolate shape, apex strongly expressed in both sexes; prothorax at dorso-lateral parts with impression; antennae thin, reach distal edge of the eye; rostrum without expressed longitudinal of cross grooves, dorsally with shallow impression at medial portion; eyes small, weakly convex outside the outline of the head.

### ***Eupachyrrhynchus* Heller, 1912-324**

Genus is represented by seven species; four new species were described within the framework of the current thesis. Genus is distributed at Islands of Luzon and Marinduque.

General characters: rostrum dorsally curved at apical part, impression at basal part; deep medial longitudinal groove, without cross groove; antennae thin, reaching or almost reaching distal margin of the eye; elytra strongly curved in dorsal view, flattened in lateral view; tibia with small growths along inner margins; eyes small, not convex from the outline of the head.

*E. auromaculatus* Rukmane-Bārbale, 2020 is characterised by small size, purple body, elytra and prothorax covered with spots of golden scales, elytra of square shape. *E. barsevskisi* Rukmane-Bārbale, 2020 is characterised by massive body, golden body without scales or scally markings; elytra strongly curved, flattened in lateral view; prothorax widened before the middle, curved. *E. barbalsi* Rukmane-Bārbale, 2020 is characterised by short, strongly rounded to almost globular elytra, that is covered with blue scally spots; body black; prothorax widened at the base. *E. viridimaculatus* Rukmane-Bārbale, 2020 is characterised by short, strongly rounded elytra, that is covered with roundish spots of green scales; body coppery; prothorax rounded, base not widened; in lateral view prothorax not flattened.

### ***Exnothapocyrtus* Schultze, 1924**

Genus is represented with five species, all known from Luzon Island: *E. cylindricollis* Heller, 1912 (= *Nothapocyrtus cylindricollis* Heller; = *Nothapocyrtus chloropunctatus* Heller), *E. alboplagiatus* Heller, 1916 (= *Nothapocyrtus alboplagiatus* Heller), *E. erytomerus* Heller, 1912 (= *Nothapocyrtus erytomerus* Heller), *E. luzonicus* Schultze, 1917 (= *Nothapocyrtus luzonicus* Schultze), *E. basifasciatus* Heller, 1912 (= *Nothapocyrtus basifasciatus* Heller).

General characters: rostrum dorsally without curves at apical part, with wide, shallow impression at basal part; moderate medial longitudinal groove; antennal scrobe extended to distal margin of eye; antennae thin; antennal scape reaching after distal margin of the eye; eyes small, not convex from the outline of the head; prothorax cylindrical, widened at the base; elytra flattened in the lateral view; each elytron with triangular shape impression along apex.

### ***Expachyrhynchus* Yoshitake, 2013**

Genus is represented with three species, all known from Palawan Island: *E. chloromaculatus* Yoshitake, 2013, *E. granulatus* Yoshitake, 2013, *E. palawanensis* Rukmane, 2019.

General characters: rostrum dorsally curved at apical part, with deep cross groove that separate rostrum from head; deep medial longitudinal groove; antennae thick; antennal scape not reaching distal margin of the eye; eyes medium sized, curved, moderately convex from the outline of the head; surface of elytra and prothorax uneven, with deep furrows; elytra flattened in lateral view, in dorsal view weakly rounded to nearly straight. *E. palawanensis* Rukmane, 2019 can be distinguished from other species with rounded prothorax and elytra; eyes strongly expressed from the outline of the head; unique scally markings on prothorax and elytra: chaotically dispersed, single scales to scale formations of green colour.

### ***Homalocyrtus* Heller, 1912**

Genus is represented with six species, with most of the species distributed at the Luzon Island: *H. harapago* Heller, 1912, *H. intermittens* Heller, 1912, *H. tumidosus* Heller, 1912; one species from Leyte Island: *H. maculatus* Schultze, 1922 and one from Bohol Island: *H. subcuneiformis* Waterhouse, 1842 (= *Apocyrtus subcuneiformis*); exact distribution except Philippine presence is not known for *H. conicus* Boheman, 1845.

General characters: rostrum dorso-lateral parts rounded; elytra of ovate shape, strongly widened at apical part, widest part after the midline; elytra with long, dense hairs along suture.

### ***Macrocyrtus* Heller, 1912**

Genus is divided into two subgenera: *Exmacrocyrtus* Schultze, 1924-365 represented by six species: *M. (E.) erosus* Pascoe, 1871, *M. (E.) ilocanus* Schultze, 1918, *M. (E.) negrito* Heller, 1912, *M. (E.) pseudopolitus* Heller, 1921, *M. (E.) caerulans* Rukmane, 2019, *M. (E.) fulgidus* Rukmane, 2019 and *Macrocyrtus* Heller, 1912 represented by nine species: *M. (M.) babuyanensis* Genka & Yoshitake, 2019, *M. (M.) benguetanus* Schultze, 1917, *M. (M.) castaenus* Pascoe, 1881, *M. (M.) contractus* Chevrolat, 1881, *M. (M.) montanus* Schultze, 1917, *M. (M.) splendidus* Genka & Yoshitake, 2019, *M. (M.) trilineatus* Schultze, 1918, *M. (M.) helleri* Janczyk, 1956, *M. (M.) stellarum* Rukmane, 2019. All species are distributed at Luzon Island.

General characters: antennae thin, antennal scape reach behind the distal margin of the eye; eyes small, slightly or not convex from outline of the head; rostrum without dorsal cross groove; hind tibia with large, rare, hitinized growths.

*Exmacrocyrtus* Schultze: shape of elytra ovate of ellipsoidal, in lateral view strongly curved, with impression along the apex.

*Macrocyrtus*: elytra in lateral view flattened.

The new taxa are mainly distinguishable from other species with unique scale marking on prothorax and elytra with the main argument for distinguish: different shape of male penis.

***Metapocyrtus* Heller, 1912-337**

The largest genera in the tribe Pachyrhynchini with total number of species 308. Genus is divided into seven subgenera: *Artapocyrtus* Heller, 1912 (32 species), *Dolichocephalocyrtus* Schultze, 1925 (27 species), *Metapocyrtus* Heller, 1912 (95 species), *Orthocyrtus* Heller, 1912 (48 species), *Sclerocyrtus* Heller, 1912 (4 species), *Sphenomorphaidea* Heller, 1912 (14 species), *Trachycyrtus* Heller, 1912 (58 species) and additional 20 species, that are not yet classified into any subgenera.

Rostrum longer than wide, except in *Artapocyrtus* (length and width equal); base of rostrum with deep cross groove; antennal scrobe near or at apex of rostrum; medial longitudinal groove and variable shape impression at basal part of rostrum present; eyes medium sized, small; antennae thin, length of segments variable; antennal scape just before or reach distal margin of the eye; prothorax punctured except *Orthocyrtus* with even prothorax.

*Artapocyrtus* Heller: rostrum square shaped or trapezoidal, length and width equal.

*Dolichocephalocyrtus* Schultze: rostrum long and narrow, basal part dorsally with hump-shaped bulge; cross groove reaches inner margin of eye; lateral parts of rostrum along genae with triangular-shaped impression.

*Metapocyrtus* Heller: rostrum with rounded dorso-lateral sides; elytra of elliptic or ovate shape; anterior margin of prothorax uneven, strongly punctured.

*Orthocyrtus* Heller: rostrum with sharp dorso-lateral parts; in dorsal contour rostrum straight, with lateral impression along cross groove.

*Sclerocyrtus* Heller: dorso-lateral edge of rostrum sharp; prothorax punctured, without groove before anterior margin; elytra punctured into puncture rows, followed by even puncture intervals.

*Sphenomorphaidea* Heller: head between eyes curved, strongly punctured; cross groove till inner margin of eye or longer; elytra strongly punctured in all length without puncture rows.

*Trachycyrtus* Heller: Both prothorax and elytra strongly punctured.

Out of 308 species, 139 have Luzon wide distribution, 78 are known from Mindanao, 61 from Visayas but 7 species are Philippine present without exact distribution data.

Genus *Metapocyrtus* is well known to mimic the members of the genus *Pachyrhynchus*: for one species of *Pachyrhynchus*, one or more species of *Metapocyrtus* mimicry can be found. During the collection of material, it was concluded, that *Metapocyrtus* individuals are more common and present in higher number than *Pachyrhynchus*.

***Nothapocyrtus* Heller, 1912-334**

Genus is represented by one species from Luzon Island: *N. translucidus* Heller, 1912.

General characters: Rostrum longer than wide, with wide, deep longitudinal groove that reach medial part of the forehead; eyes big, curved outside the outline of the head; antennal scape reach antennal margin of prothorax; elytra flattened in lateral view, in dorsal view strongly curved, narrowed towards apex.

***Pantorhytes* Faust, 1892-193**

= *Pantorrhyses* Heller, 1935-157

Genus is represented with 77 species from Papua New Guinea and Solomon Islands.

General characters: red, roundish growths on elytra in most of the species; body and legs densely covered with short, white hairs; prothorax strongly wrinkled; rostrum short and wide, with present cross and longitudinal groove, impression at basal part and one more impression along mouth; antennae thick, not reaching distal margin of the eye.

### ***Proapocyrtus*** Schultze, 1918

Genus represented with two species, one from Luzon Island: *P. luzonicus* Schultze, 1934 and one from Visayas Island group: *P. insularis* Schultze, 1918.

General characters: rostrum with expressed medial longitudinal groove to medial part of forehead and cross groove at base; first and second segments of antennae of the same length; prothorax dorsally flattened, with cross groove before anterior and posterior margin; elytra dorsally flattened, lateral parts curved in sharp angle, with triangular impression at each of the elytron along apex; apex of each elytron not connected.

### ***Pseudapocyrtus*** Heller, 1912-326

Genus represented with 12 species: *P. exsectus* Heller, 1912, *P. productus* Heller, 1912 (Philippines); *P. formicarius* Heller, 1912, *P. imitator* Heller, 1912, *P. schandenbergi* Heller, 1912, *P. multipunctatus* Schultze, 1918, *P. apicatus* Schultze, 1922, *P. multianulatus* Heller, 1929, *P. legoskyi* Link & Zettel, 2012, *P. madelaensis* Rukmane-Bārbale, 2021, *P. robertsstasinskisi* Rukmane-Bārbale, 2021 (Luzon); *P. catanduanensis* Schultze, 1922 (Catanduanes).

General characters: rostrum curved dorsally, with cross groove at base of the forehead; medial longitudinal groove in all length; eyes small, not expressed from the outline of the head; antennae thin, scape reach inner margin of the eye. Newly described *P. madelaensis* can be distinguished by strongly extended, rounded elytra, in lateral view impressed ventrally. Newly described *P. robertsstasinskisi* can be distinguished by completely black body without scally markings; eyes bigger, more strongly expressed from outline of the head; apex of elytra of square shape in males.

### ***Sphenomorpha*** Behrens, 1887-339

Genus represented with 18 species with Indonesia wide distribution.

General characters: prothorax strongly rounded to spherical; elytra flattened in lateral view; body with strong, metallic glow; eyes big, strongly convex from the outline of the head; rostrum widened to apex, bulging at apical part, impressed at basal part; antennae thin, longer than distal margin of the eye.

### ***Trichomacrocyrtus*** Yoshitake, 2018

Genus represented with seven species, with Luzon wide distribution: *T. calostigma* Yoshitake, 2018, *T. chlorostigma* Yoshitake, 2018, *T. hieroglyphicus* Schultze, 1917, *T. kalinganus* Schultze, 1922, *T. trivittatus* Schultze, 1922, *T. caerulans* Rukmane, 2019, *T. nubes* Rukmane-Bārbale, 2022.

General characters: hind tibia with thick, dense long hairs along inner margin; rostrum without dorsal cross groove; I and II segments of tarsus wide.

Newly described *T. caerulans* can be differed by presence of blue scales on prothorax and elytra; large eyes that are strongly convex from outline of the head and specific shape of male penis.

#### **GENUS *PACHYRHYNCHUS* GERMAR, 1824**

= *Sphaerogaster* Dejean, 1821-95; = *Somatodes* Schoenherr, 1823-1139; = *Sphaerogaster* Letreille, 1825-391; = *Sphaerogaster* Sturm, 1826-197; = *Sphaerogaster* Berthold, 1827-386; = *Pachirhinus* Latreille, 1828-596; = *Pochyrhynchus* Laporte, 1840-301; = *Pachyrhynchus* Desmarest, 1842-313; = *Pachyrhynchus* Desmarest, 1842-313; = *Pachyrhynchus* Gemminger and Harold, 1871-2243

#### ***PACHYRHYNCHUS* GERMAR, 1824 ZOOGEOGRAPHY IN ORIENTAL REGION**

The last summary on the distribution of the species of the genus *Pachyrhynchus* was published in 1923, in Schultze's monograph. The data includes distribution of 85 species and 13 subspecies. Since 2012, the total number of species in the genus has increased significantly, especially in less studied Islands such as Samar, Leyte and Mindanao Island. The largest increase in the number of species was found on the Island of Mindanao, where number of species increased by 37 and reached 51. This can be explained by new species deposits from Mt. Apo Nature Park and Bukidnon Highlands. The west of the Island – the mountainous region of Zamboanga – has also been explored more widely. On the Island of Luzon, the total number of species increased from 55 to 79 (24 new species).

On the 173 species of the genus *Pachyrhynchus*, 160 are distributed on Luzon Island (46%), 51 on Mindanao (29%), 19 on Samar and Visayas Islands (11%), 9 on Mindoro (5%), 8 on Panay and Lubang Islands (5%). One species was found on the Island of Romblon, where no species records were recorded previously. Outside the Philippine archipelago, eight species are distributed in Taiwan and four in Indonesia. The biogeographic origin of the species is oceanic, which explains the reason why none of the species is found on the Island of Palawan and Sulu, which are separated from the main Islands of the Philippine archipelago by a barrier. The flora and fauna of Palawan Island is more similar of that of China, while the Sulu Islands complex has its own unique flora and fauna, not like the fauna of the nearby Island of Mindanao. No species are known to be distributed on Borneo or mainland Asia, which further confirms the fact of the oceanic origin and distribution of the species. The distribution of species is limited by the inability of individuals to move by flying as well as the need for specific environmental conditions – mountain ecosystems [25, 38].

The new distribution data reveal that most species are endemic and occur on a specific island or part of an island. 12 species occur on more than one island: *P. moniliferus* (Luzon, Mindoro, Samar), *P. multipunctatus* (Luzon, Samar), while the other 10 are distributed on Island complexes where the islands separated from each other during the last ice age (PAIC). Mindanao Island complex: *P. speciosus*, *P. regius*, *P. venustus*, *P. signatus*, Luzon Island complex: *P. orbifer*, *P. phaleratus*, *P. decussatus*, *P. apicatus*, *P. moellendorfi*, *P. rukmaneeae*). Rest of the 148 species are distributed only on one specific Island. The species distributed on several islands of the Philippine archipelago are most likely of older origin and have spread across the islands from the Philippines to the Ryukyus and the Mollucas (Indonesia). Such a spread would have been possible during the Miocene – Pleistocene period, when the islands were close to each other and spread with the help of plants or other animals would have been possible. As confirmed by Schultze [87] and Su et. Al. [95] studies, passive distribution of species with the help of plants is possible.



When analysing the distribution and occurrence of species within the islands, several distribution trends were observed. In the Island of Mindanao, the Zamboanga and Bangsamoro regions are characterized as isolated from the rest of the island, and the species composition is unique and does not overlap with the rest of the island. In the central part of the island – Caraga, Soccskagen, Davao and the south of the island, there is a possible exchange of species flow, for example, *P. anichtchenkoi* is distributed in all the central regions of Mindanao and the north of the island, but is not found in Zamboanga. In summary, Zamboanga Peninsula has three species, Northern Mindanao 30, Davao 18, Soccskagen 23, Caraga 22 and Bangsamoro six. On the Island of Luzon, the distribution of species can also be observed in separate, interconnected to mountain regions. 47 species are distributed in Cagayan Valley, 39 in Cordillera Valley, 25 in Central Luzon, 20 in Calabarzon, 8 in Ilocos and Bicol, 6 in Marinduque.

Based on the supplemented distribution data, as well as the analysis of the morphological features of the genus, it is possible to hypothesize that the origin of the species can be found on the Island of Luzon with the highest intensity of species diversity. Respectively, the species from the Island of Luzon, which is considered the centre of distribution, moved northward to the islands of Taiwan, where several subspecies of *P. orbifer* and *P. moniliferus* occur on the islands of the Cagayan Valley between Luzon and Taiwan. In the southern direction, the species has spread to the island of Mindanao and in the western direction to the nearest Indonesian Islands. This is also confirmed by Van Dam et. Al. [73] phylogenetic studies showing that the genera of the Mindanao species are derived from several Luzon species.

## ANALYSES OF MORPHOLOGICAL CHARACTERS AND GENITALIA

Members of the genus *Pachyrhynchus* is characterised by relatively small size from 10 to 30mm with reduced underwings; body colour: black, blue-black, copper, red, purple, gold, or green; antennae black; characteristic markings of coloured scales of various shape and size on head, prothorax and elytra.

**Head:** shape ovate to rounded; **rostrum:** characters of the rostrum is one of the main features to distinguish genus *Pachyrhynchus* from other genera within the tribe Pachyrhynchini. Rostrum in **dorsal** view: deep cross groove at medial part, one cross groove at base of forehead, apical part bulged dorsally, straight in dorsal contour, one large or two smaller size central impression at medial part, shape and size of impression is species specific; central longitudinal groove from base of forehead to cross groove, length of longitudinal groove species specific: from base of forehead, from central part of forehead or distal edge of forehead; basal part with central impression, shape and size of which is species specific: roundish, triangular or square – shaped; in **lateral** view: in lateral contour straight up to middle, apical part bulged dorsally, apex curved downwards; basal part with deep impression that is species specific; **ventral part:** width of ventral part is species specific, part of the species not reaching antennal scrobe in dorsal view, part of the species reaching over 1/3 of width of the rostrum at each side; proportion of width and length of rostrum 1:1 for most of the species; forehead: smooth, slightly punctured or moderately punctured; rostrum smooth to pubescent; lateral parts with shorter hairs at central part to longer hairs near mouth; ventral part covered with long hairs; **eyes and genae:** compared to other genera of the tribe Pachyrhynchini, members of the genus *Pachyrhynchus* have medium sized, spherical eyes that are convex from outline of the head; convexity and size compared to width of the forehead is species specific: from ¼ to ½ of the width of the forehead. Genae smooth for most of the species, marked with single scales of round to ovate shape or irregular shape scale patches.

**Vertex:** partly covered by prothorax, smooth for most of the species to slightly punctured, straight; **tempus:** depending on size of the eye: area near the eye wrinkled for species with bigger eyes and smooth for species with smaller eyes; **antennal scrobe:** deep, from slightly before apex of rostrum

along dorso-lateral margin, moderately curved downwards, sharp angle at medial part and straight to ventral part.

**Antennae:** consists of 11 segments; **scape:** length equal to length of the rest of the segments combined, proportion can slightly vary to each side depending on species; shape narrowed at base, widened to apex, flattened in lateral view; scape not reaching distal margin of the eye; **funicle:** contain of seven segments (antennomeres), I segment longer than the rest, longer than wide; II segment shorter than I, longer than III – VII, longer than wide; segments III to VII equal in length and width; precise size proportion of segments I, II and III – VII is species specific; **club:** ovate to rounded shape, contain of three segments that are equal for most of the species; II segments can be wider or shorter compared to I and III depending on species.

**Prothorax:** smooth to slightly punctured, covered with colourful scales of various shape and colour that form dots, stripes, spots or irregular shape markings; curvatures in dorsal contour strongly vary between the species: *P. moniliferus*, *P. erichsoni* species group can be characterised by nearly spherical shape of prothorax with strongly rounded dorsal contour, widest point just at the middle; *P. congestus*, *P. ardentius* species groups can be characterised by ovate shape, with moderately curved dorsal contour, widened from anterior margin, widest point just before the middle, then narrowed to basal 3/4 and straight to subbasal part, slightly widened along posterior margin; *P. inclytus* species group can be characterised by rectangle-shaped prothorax, in dorsal contour slightly rounded to nearly straight, in lateral contour curvature slight or straight (*P. disgestus*) in all length, to spherical (*P. orbifer*); anterior margin of prothorax in most species slightly curve upwards, with cross groove at subapical part, groove can be reduced, interrupted or uninterrupted; posterior margin straight or curved upwards, with cross groove at sub basal part.

**Abdomen:** abdominal segments: segments I and II fused together, strongly wrinkled near coxa, medial part impressed, posterior margin with rare, single colourful scales of round to ovate shape, slightly covers segment III; segment III smooth, slightly impressed, posterior margin straight, lateral parts slightly wrinkled, in most species a roundish spot of colourful scales on each of the lateral parts; segments IV and V straight, lateral parts slightly wrinkled; anal segment of ovate to triangular shape, outer margin densely covered with short, light hairs, inner margin impressed at medial part in most species; presence of hairs or setae on each of the segments is species specific: from dense, long hairs in all length to rare setae in all length except apex with longer hairs; metathorax strongly wrinkled, smooth to pubescent, with grooves along coxa, lateral parts marked with scally spots.

**Elytra:** shape is strongly variable among species: globular, short elytra with lateral parts strongly rounded; ovate, elongated elytra with moderately rounded lateral parts; narrow, lanceolate elytra; **apex:** sharp / rounded / extended / square shaped in dorsal view; elytron can be connected along apex or separate; by shaped of elytra it is easy to distinguish sex of the individuals: larger, more strongly rounded elytra with strongly expressed apex in females while slender, smaller elytra with less extended apex in males; suture smooth in most of the species or with furrow; scutellum partly or completely covered, shape triangular to roundish; structure: smooth, without puncture or expressed intervals of puncture rows (*P. smaragdinus*, *P. venustus*) / elytra punctured in all length (*P. apoensis*, *P. nitcisi*) / elytra punctured in equal, smooth puncture rows that form intervals (*P. orbifer*, *P. cabrasae*) / elytra with deep furrows and puncture rows (*P. lacunosus*); in most species pubescence and longer hairs is present only along apex, with exception with longer hairs in all length; various shape and colour scally markings on elytra that is slightly variable within the species.

**Legs:** hind, middle and front legs are of similar conformation; coxae wrinkled; femur narrowed at base, widened to widest medial part, impressed along inner margin at subapical part and firmly rounded along apex; pubescent in all length; presence of scally spot or single scales along internal margin or scally line that circumscribes the femur is species variable; tibia equal in width in all length, curved ventrally,

inner margin covered with long, light hairs to small growths; base opened, with mucrones; I and II segments of tarsus equal, segment III bigger, claws shorter than length of the tarsus, ventral part densely covered with long, light hairs.

**Genitalia: Males:** shape of male aedeagus is very important character in species delimitation: length, width and curvature are species specific. In most of the species penis in lateral view is curved upwards to medial portion, then redirected ventrally forming shape of semicircle; shape of apex straight, curved downwards, rounded, sharp or extended square shaped; ostium rounded or sharpened at base, in lateral view straight or overhang the margin; parameres curved ventrally, length varies from 1:3 to 1:1 (length of parameres: length of aedeagal body); in dorsal view straight in all length to widened along base, apex narrowed, expressed. **Females:** shape of the ovipositor slightly varies among different species with variable length according to size of the individual; ovipositor in dorsal view with one growth at each lateral margin along the apex; sternite VIII of semi-circular shape with rare, long hairs along outer margin; spermatheca with specific growth, base straight, curved outwards or impressed.

**Eversion of endophallus:** additional method to distinguish species with similar morphological characters is analyses of endophallus of male penis. Shape of ejaculation tract, shape of hitinized copulation end, curvatures and impressions at the base, shape in lateral and dorsal view are all important characters that strongly vary among different species.

## THE NEW TAXONS OF THE TRIBE PACHYRHYNCHINI

The overall number of newly described taxons consist of **50** species and **four** subspecies which are **54 new taxons**. Status of one species is raised to species level.

37 species and four subspecies described in the genus *Pachyrhynchus*: *P. kraslavae* Rukmane & Barševskis, 2016, *P. marinduquensis* Rukmane & Barševskis, 2016, *P. cabrasae* Rukmane & Barševskis, 2016, *P. nitcisi* Rukmane & Barševskis, 2016, *P. antonkozlovi* Rukmane & Barševskis, 2016, *P. shavrini* Rukmane & Barševskis, 2016, *P. anichtchenkoi* Rukmane & Barševskis, 2016, *P. valainisi* Rukmane & Barševskis, 2016, *P. barsevskisi* Rukmane, 2016, *P. domino* Rukmane, 2016, *P. pseudhalconensis* Rukmane, 2016, *P. rebus* Rukmane, 2016, *P. tiko* Rukmane, 2016, *P. miltoni* Cabras & Rukmane, 2016, *P. ilgas* Rukmane, 2017, *P. orientalis* Rukmane, 2017, *P. occidentalis* Rukmane, 2017, *P. neoabsurdus* Rukmane, 2017, *P. banglas* Bollino, Sandel & Rukmane, 2017, *P. esperanza* Bollino, Sandel & Rukmane, 2017, *P. felipeae* Rukmane & Cabras, 2018, *P. franciscoi* Rukmane & Cabras, 2018, *P. layroni* Rukmane & Cabras, 2018, *P. sergejevae* Rukmane, 2018, *P. torresi* Rukmane, 2018, *P. ottomerkli* Rukmane, 2019, *P. sagittatus* Rukmane, 2019, *P. tetramaculatus* Rukmane, 2019, *P. kirklayroni* Rukmane, 2019, *P. aedamlayroni* Rukmane, 2019, *P. mindoroensis* Rukmane & Hava, 2020, *P. yoshitakei* Bollino, Rukmane & Mohagan, 2020, *P. imitans* Bollino, Rukmane & Mohagan, 2020, *P. bollinoi* Rukmane-Bārbale, 2020, *P. cinereomaculatus* Rukmane-Bārbale, 2020, *P. subpalidius* Rukmane-Bārbale, 2022; *P. cebrem* Patano & Rukmane-Bārbale, 2023;

*P. möllendorffi marinduquanus* Rukmane, 2018, *P. moniliferus babuyanensis* Rukmane, 2018, *P. moniliferus herbidus* Rukmane, 2018, *P. decussatus catanduanensis* Rukmane-Bārbale, 2020.

*P. cruciatus* Schultze, 1923 raised to species level.

One species is described in the genus *Apocyrtus*: *A. auroraensis* Rukmane-Bārbale, 2020.

Four species described in the genus *Eupachyrrhynchus*: *E. auromaculatus* Rukmane, 2019, *E. barbalsi* Rukmane, 2019, *E. barsevskisi* Rukmane, 2019, *E. viridimaculatus* Rukmane, 2019.

One species described in the genus *Expachyrrhynchus*: *E. palawanensis* Rukmane, 2019.

Three species described in the genus *Macrocyrtus*: *M. (M.) stellarum*, Rukmane, 2019, *M. (E.) caerulans* Rukmane, 2019, *M. (E.) fulgidus* Rukmane, 2019.

Two species described in the genus *Trichomacrocyrtus* ġintī: *T. caerulans* Rukmane, 2019, *T. nubes* Rukmane-Bārbale, 2022.

Two species described in the genus *Pseudapocyrtus*: *P. madelaensis* Rukmane-Bārbale, 2021, *P. robertsstasinskisi* Rukmane-Bārbale, 2021.

Species descriptions are created by detailed analysis of the morphological features of each taxon. Species specific characters are included in descriptions. As one of the main characters for species distinguishing is the shape of the male genitalia, which, because of the hard chitinous layer, is consistent within the species but varies outside the species.

One of the techniques for the classification of species is the division into species groups, where each species group include a set of species with a group-specific set of morphological characters.

## CONCLUSIONS

1. In the Oriental fauna, 641 species of the 17 genera are listed within the tribe Pachyrhynchini. 173 species belong to genus *Pachyrhynchus* Germar, 1824. 50 taxons of the tribe Pachyrhynchini were found to be new to science, 37 species and four subspecies were newly discovered in the genus *Pachyrhynchus* Germar, 1824. Each genus of the tribe Pachyrhynchini can be easily distinguished by comparison of rostrum, length of antennal scape, shape of elytra or specific generic characters.
2. The faunistic data obtained during the study significantly expands the knowledge on the variation, distribution, and occurrence of the species. For 152 species the distribution range has been supplemented, data on 21 species are known only from the original description. Distributional data of the genus *Pachyrhynchus* are presented in scientific publication. The biggest Island of Philippine archipelago, Luzon is represented by 80 species (46%), Mindanao by 51 (29%), Samar and Visayas by 19 (11%), Mindoro by 9 (5%), Panay and Lubang by 8 (5%). 12 species are known from outside the Philippine archipelago at Islands of Indonesia and Taiwan.
3. As a result of the research, an annotated catalog of the fauna of the *Pachyrhynchus* Germar, 1824 was compiled. The catalogue includes 145 species, since from publication of the catalogue 28 new species have been described and published within the genus.
4. During the study, unique data on the biology of the tribe Pachyrhynchini in several protected areas of the Island of Mindanao were collected, the data is compiled in three publications. It was concluded that the determining environmental factor for species of the genus *Pachyrhynchus* is the height above sea level and specimens are found at 700m and above, unlike members of the genus *Metapocyrtus*, where specimens are found at lower altitudes and in urbanized areas.
5. It was concluded that for distinguishing distant species it is possible to use external morphological features, such as the shape of elytra and prothorax. To distinguish species groups the shape of male genitalia and shape of female spermatheca. Within the species groups the shape of the internal sac of the male aedeagus

## REFERENCES

1. Agassiz L. 1846. Nomenclatoris zoologici index universalis continens nomina systematica classium, ordinum, familiarum et generum animalium omnium, tam viventium quam fossilium, secundum ordinem alphabeticum ID unicum disposita, adjectis homonymiis plantarum, nec non variis adnotationibus et emendationibus. 8: 393.
2. Alonso-Zarazaga M. A., Lyal C. H. C. 1999. A world catalogue of families and genera of Curculionidea (Insecta: Coleoptera) (Excepting Scolytidae and Platypodidae). Barcelona, Entomopraxis, 170-350.
3. Behrens W. 1887. Materialien zu einer Monographie der Curculionengruppe Pachyrrhynchidae. Stettiner Entomologische Zeitung, 48(7-9): 211 - 257.
4. Berthold A. A. 1827. Latreille 's Natarliche Familien des Thierreichs mit Anmerkungen und Zusdtzen. Weimar, Industr. Compt., 8: 602.
5. Blanchard E. 1853. Description des Insectes. Dumont-d'Urville, Capitaine de vaisseau. Zoologie, 4: 422.
6. Bollino M., Bordoni A. 2021. Two new species of *Metapocyrtus* (*Metapocyrtus*) Heller 1912 from Mindanao, Philippines (Curculionidae, Entiminae, Pachyrrhynchini). *Zootaxa*, 4991(2): 363 - 370.
7. Bollino M., Guerlach G. 2021. A new *Metapocyrtus* from Luzon (Philippines) (Curculionidae, Entiminae, Pachyrrhynchini). *Journal of Tropical Coleopterology*, 2(1): 1 - 8.
8. Bollino M., Medina M. N., Cabras A. 2020. Three new *Metapocyrtus* Heller, 1912 (Curculionidae, Entiminae, Pachyrrhynchini) from Mindanao Island, Philippines. *Journal of Tropical Coleopterology*, 1(1): 26 - 38.
9. Bollino M., Sandel F. 2015. Three new species of the genus *Pachyrrhynchus* Germar, 1824 from Lubang Island (Philippines) (Curculionidae: Entiminae: Pachyrrhynchini). *Munis Entomology & Zoology*, 10(2): 392 - 401.
10. Bollino M., Sandel F. 2017. Two new taxa of the subgenus *Artapocyrtus* Heller, 1912, genus *Metapocyrtus* Heller, 1912 from the Philippines (Coleoptera, Curculionidae, Entiminae, Pachyrrhynchini). *Baltic Journal of Coleopterology*, 17(1): 1 - 14.
11. Bollino M., Sandel F., Yoshitake H. 2019. Four new species of the genus *Metapocyrtus* Heller, subgenus *Artapocyrtus* Heller (Coleoptera, Curculionidae, Entiminae) from the Philippines. *Elytra, New Series*, 9(2): 395 - 407.
12. Bollino M., Sandel F., Yoshitake H. 2019. Four new species of the genus *Metapocyrtus* Heller, subgenus *Artapocyrtus* Heller (Coleoptera, Curculionidae, Entiminae) from the Philippines. *Elytra, Tokyo, New Series*, 9(2): 395 - 407.
13. Bollino M., Yoshitake H., Sandel F. 2019. A new species of the genus *Metapocyrtus* Heller, 1912, subgenus *Artapocyrtus* Heller, 1912 (Coleoptera, Curculionidae, Entiminae) from Catanduanes Island, the Philippines. *Elytra, Tokyo, New Series*, 9(1): 167 - 176.
14. Cabras A. A., Yoshitake H. 2016. Distributional and ecological notes on *Pachyrrhynchus apoensis* (Coleoptera, Curculionidae, Entiminae). *Elytra, New Series*, 6(1): 10 - 12.
15. Cabras A. A., Bollino M., Medina M. N. 2018. A new species of the subgenus *Orthocyrtus*, genus *Metapocyrtus* (Coleoptera, Curculionidae, Entiminae, Pachyrrhynchini) from Mindanao, with notes on its ecology. *Baltic Journal of Coleopterology*, 18(1): 39 - 46.
16. Cabras A. A., Lam A. W., Van Dam M. H. 2021. *Metapocyrtus um* sp. nov., a new weevil species (Coleoptera, Curculionidae, Entiminae, Pachyrrhynchini) from Davao City, Mindanao Island, Philippines. *Zootaxa*, 5068(4): 597 - 600.
17. Cabras A. A., Madjos G., Medina M. N. 2020. A new *Metapocyrtus* Heller, 1912 (Curculionidae: Entiminae: Pachyrrhynchini) from Zamboanga Peninsula, Mindanao Island, Philippines. *Journal of Tropical Coleopterology*, 1(2): 12 - 20.
18. Cabras A. A., Medina M. N. 2019. *Metapocyrtus ginalopezae* sp. n., a new *Orthocyrtus* from

- Davao de Oro, Mindanao Island. *Baltic Journal of Coleopterology*, 19(2): 205 - 211.
19. Cabras A. A., Medina M. N. 2021. Four new species of *Metapocyrtus* Heller, 1912 (Coleoptera, Curculionidae, Entiminae, Pachyrhynchini) from Mindanao Island, Philippines. *Biodiversity Data Journal*, 9(1): 1 - 20.
  20. Cabras A. A., Medina M. N. D. 2018. *Metapocyrtus* (*Artapocyrtus*) *willietorresi* sp. n. (Coleoptera: Curculionidae) from Southern Mindanao (Philippines), with notes on its ecology and mimicry complex. *Baltic Journal of Coleopterology*, 18(2): 185 - 192.
  21. Cabras A. A., Medina M. N. D., Zhang G. 2019. *Metapocyrtus kitangladensis* sp. n., a new *Pachyrhynchus cumingii* GR Waterhouse, 1841 mimic from Mindanao Island, Philippines. *ZooKeys*, 853: 119 - 129.
  22. Cabras A. A., Medina M. N., Bollino M. 2021. Two new species of the genus *Metapocyrtus* Heller, 1912 (Coleoptera, Curculionidae, Entiminae, Pachyrhynchini), subgenus *Orthocyrtus* Heller, 1912, from Mindanao Island, Philippines. *ZooKeys*, 1029(1): 139 - 154.
  23. Cabras A. A., Medina M. N., Donato J., Van Dam M. H. 2021. *Pachyrhynchus obumanuvu* sp. nov., a new species of easter egg weevil (Coleoptera, Curculionidae, Entiminae, Pachyrhynchini) from Mindanao Island, Philippines. *Baltic Journal of Coleopterology*, 21(1): 43 - 48.
  24. Cabras A. A., Medina M. N., Madjos G., Bollino M. 2022. Three new species of the genus *Metapocyrtus* Heller, 1912, subgenus *Orthocyrtus* Heller, 1912 (Coleoptera, Curculionidae, Entiminae, Pachyrhynchini), from Mindanao Island, Philippines. *ZooKeys*, 1088: 115 - 128.
  25. Cabras A. A., Nique G., Mohagan A. 2016. Diversity and distribution of pachyrhynchini (Coleoptera: Curculionidae: Entiminae) in Mt. Apo Natural Park, Philippines. *Journal of Biodiversity and Environmental Sciences*, 8(2): 312 - 319.
  26. Cabras A. A., Quimpan H. P., Medina M. N. 2021. *Metapocyrtus poncei* sp. nov., a new weevil (Coleoptera, Curculionidae, Entiminae, Pachyrhynchini) from Davao Oriental, Mindanao Island, Philippines. *Journal of Tropical Coleopterology*, 2(2): 30 - 36.
  27. Cabras A. A., Torrejos C., Medina M. N. 2021. *Metapocyrtus dagtum* sp. nov., a new flightless weevil from Davao de Oro, Mindanao Island, Philippines (Coleoptera: Curculionidae: Entiminae: Pachyrhynchini). *Biodiversity Data Journal*, 9: 1 - 11.
  28. Cabras A. A., Villanueva R. J., Medina M. N. 2021. A new species of *Metapocyrtus* Heller, 1912 (Coleoptera, Curculionidae, Entiminae) from Mindanao Island, Philippines. *Journal of Tropical Coleopterology*, 2(1): 35 - 41.
  29. Cabras A. A., Villanueva R. J., Medina M. N. 2021. Two new species of *Metapocyrtus* Heller 1912 (Coleoptera: Curculionidae: Entiminae: Pachyrhynchini) from Davao de Oro Mindanao Island, Philippines. *Baltic Journal of Coleopterology*, 21(1): 95 - 103.
  30. Chang Y., Ogawa Y., Jacucci G., Onelli O. D., Tseng H-Y., Vignolini S. 2020. Hereditary character of photonics structure in *Pachyrhynchus sarcitis* weevils: color changes via one generation hybridization. *Advanced optical materials*, 2000432: 1 - 7.
  31. Chen Y-T., Tseng H-Y., Jeng M-L., Su Y-C., Huang W-S., Lin C-P. 2017. Integrated species delimitation and conservation implications of an endangered weevil *Pachyrhynchus sonani* (Coleoptera: Curculionidae) in Green and Orchid Islands of Taiwan. *Systematic Entomolog*, 42: 796 - 813.
  32. Chevrolat L. A. 1841. Description de trente quatre especes de Coleopteres de Manille et d'un tricondyle de Ceylan. *Revue zoologique*, 221 - 228.
  33. Chevrolat L. A. 1879. Descriptions de nouvelles especes de Coleopteres la famille des Curculionides. *Bulletin de la Societe Entomologique de France*.
  34. Chevrolat L. A. A. 1881. Diagnoses de Curculionides exotiques. *Le Naturaliste* 1(62): 494 - 495.
  35. Dam M. H., Cabras A., Henderson J. B., Estrada C. P., Omer A., Dudchenko O., Aiden E. L.,

- Lam A. 2021. The easter egg weevil (*Pachyrhynchus*) genome reveals synteny in Coleoptera across 200 million years of evolution. *PLOS Genetics*, 17(8): 1 - 27.
36. Dam M. H., Cabras A., Lam A. 2021. How the easter egg weevils got their spots: Phylogenomics reveals Mullerian mimicry in *Pachyrhynchus* (Coleoptera, Curculionidae). *bioRxiv*.
  37. Desmarest E. 1842. Coleopters. Voyage autour du Monde execute pendant les annees. Sur la corvette La Bonile commandee par M. Vaillant. *Zoologie*. 1+334 pp.
  38. Dickerson R. E. 1928. Distribution of life in the Philippines. *Monographs of the Bureau of Science*. 21: 1 – 322.
  39. Erichson W. F. 1834. *Coleoptera*. pp. 219 - 276.
  40. Eydoux & Soulayet 1839. *Travaux inedits. Quelques nouvelles especes d'oiseaux*, par Fr. de La Fresnaye. *Revue Zoologique*: 266.
  41. Fairmaire L. 1897. *Coleopteres de l'Inde et de la Malaisie*. Notes from Leyden Museum, 18(4): 225 - 240.
  42. Faust J. 1892. Fünfneue Curculioniden von Australien. *Stettiner Entomologische Zeitung*, 53(7-9): 179-184.
  43. Faust J. 1895. Einige neue Luzon-Curculioniden des Museum Tring. *Stettiner Entomologische Zeitung*, 56: 3 - 21.
  44. Gemminger M. And Harold E. 1871. *Catalogus Coleopterorum hucusque descriptorum synonymicus etsystematicus*. Yol. 8. Curculionidae. Monachii, E. H. Gumnri (G. Beck). Pp. 2181-2668+ 10 pp.
  45. Genka M., Yoshitake H. 2018. A list of Metapocyrtus weevils (Coleoptera, Curculionidae, Entiminae) intercepted at import plant quarantine in Japan, with descriptions of two new species. *Elytra*, Tokyo, New Series, 8(2): 249 - 262.
  46. Genka M., Yoshitake H. 2019. Two new species of the genus *Macrocyrtus* Heller (Coleoptera, Curculionidae, Entiminae) from Luzon, the Philippines. *Elytra*, Tokyo, New Series, 9(1): 155 - 165.
  47. Germar E. F. 1824. *Insecten in Bernstein eingeschlossen, beschrieben aus dem academischen Mineralien - Cabinet zu Halle*. *Magazin der Entomologie*, 1(1): 11-18.
  48. Heller K. M. 1899. Neue kafer von den Philippinen. *Abhandlungen der Berichte des Koniglichen Zoologischen und Anthropologische-Ethnographischen Museums zu Dresden* 7(8): 1 - 8.
  49. Heller K. M. 1908. Vierter Beitrag zur Papuanischen Kilferfauna. *Abhandlungen und Berichte des Konig. Zoologischen und Anthropologisch Ethnographischen Museums zu Dresden* 12(1): 34.
  50. Heller K. M. 1912. Philippinische Russelklflfer. *Philippine Journal of Science*, 7(5): 295-346.
  51. Heller K. M. 1921. New Philippine Coleoptera. *Philippine Journal of Science*, 19 (5): 523-627.
  52. Heller K. M. 1923. Curculiollidae und Brenthidae. In: EBNER, R. *Wissenschaftliche Ergebnisse der mit UnterstOtzung der Akademie der Wissenschaftell in Wien aus der Erbschaft Treitl von F. Werner unternommenen zoologischen Expedition nach dem anglilgyptischen Sudan (Kordofan) 1914*. XI. Coleoptera A. *Denkschriften der mathematischnaturwissenschaftliche Klasse der Akademie der Wissenschaften in Wien* 98, 165 - 199.
  53. Heller K. M. 1929. Neue philippinische Russelkafer aus der Tribus Pachyrrhynchini. *Wiener Entomologische Zeitung*, 46(1): 1 - 19.
  54. Heyne A. And Taschenberg O. 1907. *Die emtischen Ktifer in Wort und Bild*. Leipzig, 219-262.
  55. Hsu C-F., Tseng H-Y., Hsiao Y., Ko C-C. 2017. First record of the host plant and larvae of

- Pachyrhynchus sonani* (Coleoptera: Curculionidae) on Lanyu Island, Taiwan. *Entomological Science*, 20(2): 288 - 291.
56. Huang L-C., Huang W-S., Lin C-P., Nuneza O. M., Tseng H-Y., Tang H-C 2018. Captive breeding of two insular populations of *Pachyrhynchus sarcitis* (Coleoptera: Curculionidae) from Lanyu and Babuyan Islands. *Journal of Asia-Pacific entomology*, 21: 1233 - 1238.
  57. Ienistea M. A. 1986. A new hierarchical system of Arthropoda, mainly referring to insects. *YES Quarterly*, 3(2): 13-38.
  58. INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE. 1970. Opinion 928. *Pachyrhynchus* Gennar, 1824 (Insecta: Coleoptera): validated under the plenary powers. *Bulletin of Zoological Nomenclature*, 27(2): 93-94.
  59. INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE. 1994. Opinion 1770. *Pachyrhynchus* Germar, 1824, *Somatodes* Schoenherr, 1840 and the specific name of *Pachyrhynchus moniliferus* Germar, 1824 (Insecta, Coleoptera): conserved. *Bulletin of Zoological Nomenclature*, 51 (2): 170-171.
  60. Kano T. 1936. Some problems concerning the biogeography of Kotosho. *Geographical Review of Japan*, 12: 1107 - 1133.
  61. Kono H. 1929. Kurzrussler aus dem japanischen Reich. *Journal of the Faculty of Agriculture, Hokkaido Imperial University*, 24(5): 153 - 242.
  62. Kono H. 1942. Die Russelkafer auf der Insel Kotosho. *Insecta Matsamurana*, 16: 22-27.
  63. Kraatz G. 1888. Anhang. 1. Doreadion blanchardi Mulsant, 75-76S. In: Heyden L. F. J. D. Von.: Neue und interessante Coleopteren aus Malatia in Mesopotamien. *Deutsche Entomologische Zeitschrift*, 32: 72 - 78.
  64. Kuntzen H. 1914. Einige Ergänzungen zu zwei Arbeiten K. M. Hellers uber Russelkafer. *Berliner entomologische Zeitschrift*, 4: 448 - 454.
  65. Laporte F. L. 1840. Histolre Naturelle des Animawc Artlcules, Annelides, Crustaces, Arachnldes, Myriapodes etInsectes. *Histolre Naturelle des Insectes Coleopteres*. Avec une Introduction renfermant l'anatomle et la physiologie des animawe articules, parM. Brulle, 2: 563.
  66. Latreille P. A. 1828. Rhynchophores ou Portebec. *Bory de Saint-Vmcent*, 584-603.
  67. Latreille P. A. 1825. *Familles Naturelles du Regne Animal*. Paris. Bailliere. 570 pp.
  68. Lee C-Y., Yo S-P., Clark R. W., Hsu J-Y., Liao C-P., Tseng H-Y., Huang W-S. 2018. The role of different visual characteristics if weevils signalling aposematism to sympatric lizard predators. *Journal of Zoology*, 306: 36 - 47.
  69. Lin S-M., Li T-W., Liou C-H., Amaraga A. K. S., Cabras A., Tseng H-Y. 2021. Eggs survive through avian guts - A possible mechanism for transoceanic dispersal of flightless weevils. *Ecology and Evolution*, 00: 1 - 6.
  70. Mohagan A. B., Patano Jr. R. R., Hongco A. L., Lagunday N. F., Cortico F. P., Amoroso V. B. 2018. Species occurrence of weevils (Coleoptera: Curculionidae) in the Baganihan, Marilog Forest Reserve, Marilog District, Davao City, Philippines. *Journal of Biodiversity and Environmental Sciences*, 13(2): 30 - 34.
  71. Mohagan A. B., Patano Jr. R. R., Melencion M. G., Salas D. S., Cortico F. P., Amoroso V. B. 2020. Diversity of weevils (Coleoptera) in Marahan, Marilog Forest Reserve, Southern Mindanao, Philippines. *Journal of Tropical Science*, 10(3): 259 - 270.
  72. Oberthur R. 1879. Notes sur quelques Coleopteres recoltés aux îles Sanghir par les chasseurs de M. A. A. Bruijn et description de trois especes nouvelles. *Annali del Museo Civico di storia di Genova*, 14: 570 - 571.
  73. Parisotto A., Steiner U., Cabras A. A., Van Dam M. H., Wilts B. D. 2022. *Pachyrhynchus* weevils use 3D photonic crycstals with varying degrees of order to create diverse and brilliant displays. *Small*, 2200592: 1 - 13.
  74. Pascoe F. P. 1871. Contributions towards a Knowledge of the Curculionidae. *Zoological*



- Journal of the Linnean Society, 154 - 218.
75. Patano Jr. R. R., Amoroso V. B., Mohagan A. B., Guiang M. M. M., Yap S. A. 2021. Two new species of the genus *Metapocyrtus* Heller, 1912 (Coleoptera: Curculionidae: Entiminae), from Mindanao Island and an updated checklist of *Metapocyrtus* species in the Philippines. *Raffles bulletin of Zoology*, 69: 282 - 303.
  76. Patano Jr. R. R., Amoroso V. B., Mohagan A. B., Maglangit E. P. T., Cortico F. P., Yap S. A. 2022. Two new species of *Metapocyrtus* Heller, 1912 (Coleoptera: Pachyrhynchini) from Mount Natampod, Pantaron Range, Bukidnon, Mindanao, Philippines. *Philippine Journal of Science*, 152(2): 767 - 778.
  77. Patano Jr. R. R., Mohagan A. B., Amoroso V. B., Cortico F. P., Yap S. A. 2020. A new species of *Metapocyrtus* (Curculionidae: Entiminae: Pachyrhynchini) from Southern Mindanao, Philippines. *Philippine Journal of Systematic Biology*, 14(3): 1 - 5.
  78. Sakaguchi S. 1927. The provisional list of the insects collected in Okinawa Islands. Wakayama Normal School, Japan.
  79. Sandel F., Bollino M. 2018. Four new species of *Metapocyrtus* Heller, 1912, from Mindoro Island, Philippines (Coleoptera, Curculionidae, Entiminae, Pachyrhynchini). *Baltic Journal of Coleopterology*, 18(2): 139 - 158.
  80. Schoenherr C. J. 1826. *Curculionidum dispositio methodica cum generum characteribus, descriptionibus atque observationibus variorum seu Prodomus ad Synonymiae Insectorum. partem IV.* Lipsiae. Fleischer, 10 + 338 pp.
  81. Schoenherr C. J. 1845. *Genera et Species Curculionidum, Cum Synonymia Hujus Familiae. Species Novae aut Hactenus Minus Cognitae, Descriptionibus a Dom. L. Gyllenhal, C. H. Boheman, O. J. Fahraeus, et Entomologis Aliis Illustratae. Pars Secunda. Supplementum continens Roret*, 8: 504 pp.
  82. Schultze W. 1916. A catalogue of Philippine Coleoptera. *The Philippine Journal of Science*, 11(2): 95 - 194.
  83. Schultze W. 1917. Fourth contribution to the coleoptera fauna of the Philippines. *The Philippine Journal of Science*, 12(4): 249 - 259.
  84. Schultze W. 1919. Seventh contribution to the Coleoptera fauna of the Philippines. *The Philippine Journal of Science*, 15(6): 545 - 561.
  85. Schultze W. 1920. Fauna of the Philippines. *The Philippine Journal of Science*, 16: 191.
  86. Schultze W. 1922. Neunte Beitrag zur Coleopteren fauna der Philippinen. *The Philippine Journal of Science*, 21(6): 569 - 596.
  87. Schultze W. 1923. A monograph of the Pachyrhynchid group of the Brachyderinae, Curculionidae: Part I. The genus *Pachyrhynchus* Germar. *The Philippine Journal of Science*, 23: 609 - 673.
  88. Schultze W. 1924. *The Philippine Journal of Science*, 24: 309 - 366.
  89. Schultze W. 1924. A monograph of the Pachyrhynchid group of the Brachyderinae, Curculionidae: Part II. The genera *Eupachyrhynchus*, *Macrocyrtus*, *Eumacrocyrtus*, *Apocyrtus*, *Proapocyrtus*, *Pseudapocyrtus*, *Nothapocyrtus*, and *Exnothapocyrtus*. *The Philippine Journal of Science*, 24(3): 359-390.
  90. Schultze W. 1925. *The Philippine Journal of Science*, 26: 131 - 309.
  91. Schultze W. 1934. Thirteenth contribution to the Coleoptera fauna of the Philippines. *The Philippine Journal of Science*, 53(3): 331 - 337.
  92. Snellen van Vollenhoven S. C. 1864. Description de quelques especes de coleopteres. *Tijdschrift voor Entomologie*, (7): 145 - 170.
  93. Stein J. P. E. F. 1868. *Catalogus Coleopterorum Europae.* Berolini, Friderici Nicolai, 4: 149.
  94. Stjorm J. 1826. *Catalog meiner Insecten-Sammlung.* Erser Theil. Kaer. Nilnberg, 8+208+16.
  95. Su Y. C., Wang J. F., Villanueva R. J. T., Nuneza O. M., Lin C. P. 2014. Hopping out of

- Mindanao: Micene – Pleistocene geological processes and cross island dispersal as major drivers of diversity for Philippine treehoppers. *Journal of Biogeography*, 41 (7): 1277 – 1290.
96. Tseng H-Y., Huang W-S., Jeng M-L., Villanuava R. J. T., Nuneza O. M., Lin C-P. 2017. Complex inter-island colonization and peripatric founder speciation promote diversification of flightless *Pachyrhynchus* weevils in the Taiwan-Luzon volcanic belt. *Journal of Biogeography*, 1 - 12.
  97. Waterhouse G. R. 1841. XLV. Descriptions of the Species of the Curculionideous Genus *Pachyrhynchus*, Sch., collected by H. Cuming, Esq., in the Philippine Islands. By G. R. Waterhouse, Esq., V. P. E. S. Mr. G. R. Waterhouse's Descriptions of the Species of the Genus *Pachyrhynchus*: 310 - 327.
  98. Waterhouse G. R. 1853. Descriptions of new genera and species of Curculionides. *Transactions of the Entomological Society of London*, 2(5): 172-176.
  99. Yap S. 2008. Checklist of the *Metapocyrtus* complex (Curculionidae: Entiminae: Pachyrhynchini) of the Philippines. *Asia Life Sciences*, 17(2): 249 - 260.
  100. Yap S., Gapud V. P. 2007. Taxonomic review of the genus *Metapocyrtus* Heller (Coleoptera: Curculionidae: Entiminae). *The Philippine Entomologist*, 21(2): 115 - 135.
  101. Yeh H-Y., Tseng H-Y., Lin C-P., Liao C-P., Hsu J-Y., Huang W-S. 2018. Rafting of floating fruit is effective for oceanic dispersal of flightless weevils. *Journal of Experimental Biology*, 221 (190488): 1 - 8.
  102. Yoshitake H. 2011. A new species of the subgenus *Artapocyrtus* of the genus *Metapocyrtus* (Coleoptera: Curculionidae: Entiminae) from Mindanao, the Philippines. *Esakia*, 50: 115 - 119.
  103. Yoshitake H. 2012. Nine new species of the genus *Pachyrhynchus* Germar (Coleoptera: Curculionidae) from the Philippines. *Esakia*, 52: 17 - 34.
  104. Yoshitake H. 2013. A new genus and two new species of the tribe Pachyrhynchini (Coleoptera: Curculionidae) from Palawan Island, the Philippines. *Esakia*, 53: 1 - 8.
  105. Yoshitake H. 2016. A new synonymy of *Pachyrhynchus apoensis* Yoshitake (Coleoptera, Curculionidae, Entiminae). *Elytra*, Tokyo, New Series, 6(2): 197 - 198.
  106. Yoshitake H. 2017. Notes on Pachyrhynchini jewel weevils (Coleoptera: Curculionidae: Entiminae) and other insects showing remarkable resemblance in color and body pattern characteristics. *Gekkan-Mushi*, 553: 22 - 40.
  107. Yoshitake H. 2017. Notes on *Pachyrhynchus* Jewel weevils (Coleoptera, Curculionidae, Entiminae) from the Papuan Region. *Elytra*, Tokyo, New Series, 7(1): 241 - 246.
  108. Yoshitake H. 2017. Six new taxa and a new synonym of the genus *Pachyrhynchus* Germar (Coleoptera, Curculionidae, Entiminae) from the Philippines. *Elytra*, Tokyo, New Series, 7(1): 247 - 263.
  109. Yoshitake H. 2017. A new genus and new species of the tribe Pachyrhynchini (Coleoptera, Curculionidae, Entiminae) from the Philippines. *Elytra*, Tokyo, New series, 7(2): 519 - 525.
  110. Yoshitake H. 2018. A new genus and two new species of the tribe Pachyrhynchini (Coleoptera, Curculionidae, Entiminae) from the Philippines. *Elytra*, Tokyo, New Series, 8(1): 5 - 14.
  111. Yoshitake H. 2018. Occurrence of *Pachyrhynchus croesus* Oberthur (Coleoptera, Curculionidae, Entiminae) on Salibabu Is., the Talaud Is., Indonesia. *Elytra*, Tokyo, New Series, 8(1): 15 - 16.
  112. Yoshitake H. 2018. Occurrence of *Pachyrhynchus forsteni* Snellen van Vollenhoven (Coleoptera, Curculionidae, Entiminae) on Makian Is., the Maluku Is., Indonesia. *Elytra*, Tokyo, New Series, 8(1): 17 - 18.
  113. Yoshitake H. 2018. A new subspecies of *Pachyrhynchus multipunctatus* Waterhouse (Coleoptera, Curculionidae) from Cebu Is., the Philippines. *Elytra*, Tokyo, New Series, 8(2): 245 - 248.

114. Yoshitake H. 2019. Two new species of the jewel genus *Pachyrhynchus* Germar (Coleoptera: Curculionidae: Entiminae) from Luzon, the Philippines. *Gekkan-Mushi*, 576: 22 - 27.
115. Yoshitake H. 2019. Three new species and a new subspecies of the jewel weevil genus *Pachyrhynchus* Germar (Coleoptera: Curculionidae: Entiminae) from the Philippines. *Gekkan-Mushi*, 578: 36 - 43.
116. Yoshitake H. 2019. *Pachyrhynchus striatus* Waterhouse, 1841, a new synonym of *Pachyrhynchus roseomaculatus* Waterhouse, 1841 (Coleoptera, Curculionidae, Entiminae). *Elytra*, Tokyo, New Series, 9(1): 193 - 195.
117. Yoshitake H. 2019. Two new species of the jewel genus *Pachyrhynchus* Germar (Coleoptera: Curculionidae: Entiminae) from northern Luzon, the Philippines. *Gekkan-Mushi*, 582: 34 - 39.
118. Yoshitake H. 2019. Precise locality of *Pachyrhynchus roseomaculatus* Waterhouse (Coleoptera, Curculionidae, Entiminae) in the Philippines. *Elytra*, New Series, 9(2): 378 - 378.
119. Yoshitake H. 2019. *Pachyrhynchus sibuyanensis* Rukmane, 2019, a new synonym of *Pachyrhynchus naokae* Yoshitake, 2019 (Coleoptera, Curculionidae, Entiminae). *Elytra*, New Series, 9(2): 408 - 408.
120. Yoshitake H. 2019. Two new species of the genus *Pachyrhynchus* Germar (Coleoptera, Curculionidae, Entiminae) from Luzon, the Philippines. *Elytra*, New Series, 9(2): 409 - 416.
121. Yoshitake H. 2020. A new species of the genus *Pachyrhynchus* Germar (Coleoptera, Curculionidae, Entiminae) from Southern Luzon, the Philippines. *Bulletin of the Kyushu University Museum*, 17: 109 - 114.
122. Yoshitake H. 2020. Additional records of *Metapocyrtus* (*Trachycyrtus*) *yonagunianus* Chujo (Coleoptera, Curculionidae, Entiminae) from the Okinawajima Islands in the central Ryukyus, southwestern Japan. *Elytra*, New Series, 10(1): 145 - 146.
123. Yoshitake H., Bollino M. 2019. Comments of distribution records of some *Pachyrhynchus* species (Coleoptera, Curculionidae, Entiminae). *Elytra*, Tokyo, New Series, 9(1): 181 - 182.
124. Yoshitake H., Bollino M., Sandel F. 2019. *Pachyrhynchus elenae* Rukmane, 2016, a new synonym of *Pachyrhynchus phaleratus* Waterhouse, 1841 (Coleoptera: Curculionidae: Entiminae). *Zootaxa*, 4585(1): 197 - 200.
125. Yoshitake H., Bollino M., Sandel F. 2019. Two new species of the genus *Pachyrhynchus* Germar, 1823 (Coleoptera, Curculionidae, Entiminae) from the Islands of Bohol and Mindanao in the Philippines. *Elytra*, Tokyo, New Series, 9(1): 183 - 191.
126. Yoshitake H., Tone K. 2020. Additional records of *Metapocyrtus* (*Trachycyrtus*) *adpersus* (Waterhouse) (Coleoptera, Curculionidae, Entiminae) from Okinawajima Island, the Ryukyus, Japan. *Elytra*, New Series, 10(1): 240 - 240.
127. Yoshitake H., Tsuchiya T. 2020. *Pachyrhynchus infernalis* Fairmaire (Coleoptera, Curculionidae, Entiminae) collected on Kumejima Island in the central Ryukyus, Japan. *Elytra*, New Series, 10(1): 218 - 218.
128. Yoshitake H., Tsuji N. 2019. Occurrence of *Metapocyrtus* (*Trachycyrtus*) *adpersus* (Waterhouse) (Coleoptera, Curculionidae, Entiminae) in Japan and Singapore. *Elytra*, Tokyo, New Series, 9(1): 177 - 179.
129. Yoshitake H., Yap S. A. 2017. Four *Pachyrhynchini* weevils exhibiting allopatric convergence in color and markings, with descriptions of three new taxa from Luzon, the Philippines. *Elytra*, Tokyo, New series, 7(2): 331 - 341.