Mallophaga Indica VIII. Harrison's law versus Struthiolipeurus
with remarks on host relationships

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While working on Struthiolipeurus stresemanni KÉLER collected on a captive Rhea
from the Calcutta Zoo, the author paid attention to the distribution and probable evolution
Some of the aspects in relation to what we may call "Harrison's Law" are discussed in
this paper.

HARRISON (1915) stated that

"In general, large Mallophaga are found upon large birds. This is not by any means always
true. If it were, we should expect to find the largest Mallophagan species upon the ostrich, where
as it occurs upon a condor ... But, in general, when a genus is well distributed over a considerable
number of nearly related hosts, the size of the parasite is roughly proportional to the size of the
host."

Harrison's law has since proved true in many a case and CLAY (1951) tried to explain
the law in the light of WETMORE'S view and Bergmann's Law. According to WETMORE
(1922) larger birds have lower body temperature, and Bergmann's law states that larger
species of animals are found in colder climates. Thus, larger hosts with relatively lower
body temperatures harbour larger parasites. CLAY (op. cit.) however, suspected whether
closely related species really have differential temperature. ASH (1960) reported that in
a species the actual skin temperature is higher than the one slightly above, but under
the feathers. Though, HARRISON (op. cit.) doubted his own hypothesis as applied to Mallo-
phaga parasitic on ostrich, the law still holds good, if we infer the infestation of these
parasites as a secondary one — for, in case of a secondary infestation, the size of the
parasite need not be proportional to that of its secondary host. The reasons to conclude
the infestation is not primary is reflected in the morphology of the genus itself and out-
lined below.

HARRISON (1914) was the first to suggest that the ostrich of Africa and rheas or nandus
of South America harbour the same parasitic fauna. He stated that

"Of the parasites of the struthious, Degeerella asymmetrica is found upon the emu; Lipoeurus
asymmetricus upon two species of rhea; and Lipoeurus quadrimaculatus upon the ostrich and also
upon a species of rhea. These three species are undoubtedly congeneric, and should be included
in a genus distinct from either of those mentioned above. The two latter species are distinguished by
a peculiar asymmetry of the chitinous border of the clypeus, the precise form of which is best
seen from the accompanying text figure, from all other Mallophaga. The young of Degeerella
asymmetrica exhibits a precisely similar structure, which in the adult increases in extent and hence

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folded on itself in a remarkable manner, forming a V-shaped cleft, the relation of which is again more easily seen from the figure. It is hardly possible to come to any other conclusion than that these three species have been derived from a common ancestor. And we find these on hosts which admittedly have had a common origin and which are now widely separated upon three distinct continents."

CUMMINGS (1916) established the genus *Struthiolipeurus* for *L. asymmetricus* and *L. quadriramulatus* and considered that *D. asymmetrica* deserves a separate genus by itself; that *L. latus* also parasitic on rheas may be incorporated in a separate genus, but all the three genera form a related group and should be accommodated in a separate subfamily. He further added that

"It is a curious and significant fact that in three of these species parasitising Struthious birds the margin of the anterior part of the head is from some cause by no means evident asymmetrically developed. The asymmetry in the anterior incursion of the head is least developed in *L. quadriramulatus*, while in the larvae of this species, as well as in the larvae of *L. asymmetricus*, the asymmetry is absent even in stage II. That *D. asymmetrica*, in which the adult asymmetry is most developed, the whole of the preantennal region being bent over on itself to form a longitudinal channel, is a derivative of the other two species seems clear from the observation made by HARRISON that the larvae of *D. asymmetrica* possess asymmetrical heads of a "precisely similar structure" to that found in the adults of the other two."

KÉLER (1936) erected the monotypic genus *Dahlemhornia* to accommodate *D. asymmetrica* found on emu; and CLAY (1950) considers that *Dahlemhornia*, from its general morphology is not closely related to *Struthiolipeurus*, and the asymmetry may be a feature of convergence "in response to some common feature in the structure of the feathers" and that asymmetry in head is found elsewhere in another unrelated genus *Bizarriiforms*.

EICHLER (1940) established the genus *Meinerthiagalliellia* to accommodate *L. latus* referred by CUMMINGS (vide supra) parasitic on rheas (*Rhea americana*) and later described another species *M. schubarti* found on *Pterocnemia pennata*. HOPKINS and CLAY (1952) considered *M. chocayaensis* CARRIKER parasitic on *P. pennata garleppi* as conspecific with *M. schubarti*.

HARRISON (1910) proposed a new name *Ethiopium rheae* for PIAGET'S *L. asymmetricus* referred above, since the latter is pre-occupied. Likewise, *L. quadriramulatus* (vide supra) has a senior synonym *S. struthionis*. While HOPKINS and CLAY (1952) recognized three more species besides *S. rheae* and *S. struthionis* in the genus *Struthiolipeurus* viz., *S. andinus* CARRIKER on *Pterocnemia pennata garleppi*, *S. nandu* EICHLER and *S. renshii* EICHLER on *Rhea americana*. KÉLER (1960) considered *S. rheae* (= *L. asymmetricus*) also as conspecific with *S. struthionis*. He described *S. stresemanni* from *Rhea americana*. KÉLER (1960) stated that *S. struthionis* is parasitic on African ostrich, *Struthio camelus*, *S. nandu*, *S. renshii* and *S. stresemanni* on South American *Rhea americana* and *S. andinus* on *Pterocnemia pennata*, also a South American bird.

The material under study is referable to *S. stresemanni* KÉLER, though there are minor variations especially in the size range; they do not warrant its separation. The males fall within the size range given by KÉLER (op. cit.), but the females are larger. Further, contrary to the usual reports the males outnumbered the females in the present case, the teneral forms not taken into consideration in either case. Though, CUMMINGS (op. cit.) observed that the asymmetry is absent even in stage II in *S. struthionis* (= *L. quadriramulatus*, *L. asymmetricus* and *S. rheae*) it was noticed in all the instars in *stresemanni*. The asymmetry was marked first at the pulvinar region and gradually extended to other regions in *S. stresemanni*. CLAY (1949; 1950) pointed that feather structure affects the head structure. It is presumed that due to altered feather structure on the new hosts, the pulvinus first undergoes the morphological change, since it serves as a hold-fast and aids in feeding, followed by mandibular mechanism resulting in the asym-
metry of the entire head structure chiefly by the pulls of mandibular muscles. Presuming
CUMMINGS (op. cit.) is right that the "larva" do not show asymmetry even up to stage II
in S. strihiomus, then it indicates that the asymmetry is a later development in the ontogeny.
MIDDLETON (1918) pointed that the feather structure is peculiar to both Struthiion-
iformes and Rheiformes; with elongate ribbon-like barbs more or less intermediate
between ordinary downy and pennaceous type, but different from either in no differen-
tiation of base and pennulum and no barbules except rudimentary prongs in body fea-
thers in the former; like the former, the aftschaft is absent also in rheas, the barbules
are intermediate between the downy and pennaceous type, but resembling those of
the typical feather of the penguins.
KÉLER (1940) observed casually that amongst the recent genera *Falconipennis* com-
comes close to *Struthiopipes* in the presence of "Nodiimbales". It is likely that *Falcopi-
ennis* parasitic on the diurnal birds of prey (Falconiformes) with symmetrically poised
cephalic incassations may be the direct ancestor of *Struthiopipes*, or both might have
descended from a common ancestor in the bygone, and the cephalic incassations became
asymmetrical due to altered feather structure on the new host. The fact that the asym-
metry was first noticed in the pulvinal region amply suggests that the asymmetry is
resulted due to feather structure only since pulvinus is the organ of holding. KÉLER
(op. cit.) assumed the genus might have evolved sometime during Eocene. CLAY (1940;
1950) stated that the absence of differentiation of feather is probably responsible for
limited speculation in parasitic genera as it does not offer many ecological niches. The
common occurrence of the genus on now geographically separated rheas and ostrich,
may be accounted that the genus might have been passed on to them from a common
ancestor before the continents separated permanently, and remained unchanged all
these millions of years due to non-differentiation of feather structure (see remarks of
CLAY and CHANDLER above). Once the theory of secondary infestation of either *Falcopi-
ennis* from some member of Falconiformes or a common ancestor of *Falconipennis* and
*Struthiopipes* on to the Struthioniformes and Rheiformes is accepted, then the size.
of the parasite and its host need not be directly proportional as enunciated by HARRISON
It may be added that Falconiformes, the host order of *Falconipennis*, radiated very much
by the time Struthioniformes and Rheiformes are clearly distinguishable in the fossil
stage (see HOWARD, 1950).
Remarks on host relationships. MAYR and AMADON (1951) stated that the problem
of ratite phylogeny continues to receive much attention, but the present consensus is
that the main groups are of independent origin. DE BEER (1936) excellently discussed
the evolution of Ratitae. HOWARD (op. cit.) remarked that convincing arguments were
advanced by protagonists that Ratitae have evolved from a volant stock on one hand,
and on the other directly from the dinosaurs. Recently, GLENNY (1955) remarked that
"On the basis of the carotid patterns in *Struthio, Casuarius*, and *Dromiceius* it would appear
that these three genera are more closely related than any of the above genera are to *Rhea* and
*Pterocnemia*. It may be inferred that the old-world and the new-world genera arose from different
avian stocks early in the course of avian evolution."
EICHLER (1949), CLAY (1950) and CAMERON (1952, 1956) reported the common occu-
rence of the feather mites *(Pterolichus bicaudatus and Paralycs paucus)* and the
cestode *(Hollingia struthiocama)* in ostrich and rheas. SKRAJNE (1917) also reported

1) The author was unaware of KÉLER's paper in the early part of the present study and inde-
dependently came to the conclusion that *Falconipennis* with its symmetrically poised cephalic
incassations may be the probable ancestor of this genus. The matter was referred to Dr. Miss Theresa
CLAY, c/o Department of Entomology, British Museum (Natural History), London, who kindly
expressed that anything is possible in the evolution of the Ichneumon Mallophaga.

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a nematode (*Dichelionema rheae = Contratospiculum horrida*) common to both ostrich and rheas. Thus, the Mallophaga, Acarina, Cestoda, and Nematode Philometrae do not support GLENNY'S contention and suggests that ostrich and rheas or nandus had a common origin in the past.

Zusammenfassung

Auf der Basis der Morphologie des Kopfes und der Wirtsbeziehungen in bezug auf die Harrisonische Regel wird die vermutliche Evolution der Gattung *Struthiolipeurus* diskutiert. Es wird die Auffassung vertreten, daß *Struthiolipeurus* sowohl den Strauß wie die Nandu sekundär besiedelt haben mag und dann den asymmetrischen Kopf infolge der besonderen Federrücktraktor entwickelt haben möchte.

Résumé

На основании морфологии головы и филогенетического рода хозяев применяя пра- вило Гаррисона, автор устанавливает эволюцию рода *Struthiolipeurus*. Принимаетя кон- цепция, по которой этот род пухоедов заселил страуса и нанду вторично, и позже приобрёл ассиметричное строение головы вследствие особенностей структуры их перьев.

Summary

The probable evolution of the genus *Struthiolipeurus* on the basis of the morphology of the head and host relationship in relation to Harrison's law was discussed in this paper. It is believed that *Struthiolipeurus* might have secondarily infested ostrich and rheas and developed the asymmetrical head due to the peculiar feather structure.

Literatur


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**Odagnia ornata in der ärztlichen Praxis**

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Mit Tafel I


*Vor allem von Odagnia ornata (auch Boophthora sericata) verhält sich ähnlicher [Ins.: Dipt.; Simuliid.] wurden bis zu schwerste Krankheitserscheinungen beim Menschen beschrieben und analysiert.*

Kriebelmücken, wohlbe kannt in der Veterinärmedizin und in den Tropen, stellen auch in unserer geographischen Zone wichtige ubiquitäre menschliche Ektoparasiten dar.


Die Symptomatologie ist von Beginn an eigentümlich. Die Kriebelmücke kommt geräuschlos geflogen und setzt sich, ohne ein Gefühl von Hautbereiterung zu erwecken, nieder. Ihr Stich ruft zuweilen heftigen Schmerz hervor; meistens aber ist der Stich schmerzlos. Nachdem die vollgesogene Kriebelmücke weggeflogen ist, bleibt über dem