102. *Daonella* Beds of Rifu, near Sendai.

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Daonella Beds are exposed along the railway line between the two stations of Rifu and Matsushima, 12 km. and 24 km., respectively, northeast of Sendai, province of Rikuzen. These Triassic deposits and some igneous rocks intruding them are unconformably overlaid by a Neogene complex. Southeast of the railway line all the hills are formed of Neogene rocks, but at few places the basement complex is exposed either beneath the very base of the younger complex or is quite uncovered, as erosion-relics, amidst alluvial land.

The most prevailing Triassic sediment of this district is a hard compact argillite, dark gray in colour and usually heavy bedded; occasionally this intercalates thin sandstone layers. The whole complex forms an anticline of approximately N—S trend and with an average dip of 30°. Near the Rifu Station the strike changes abruptly to E—W. The Triassic rocks in the two different strikes are separated by a fault, with the fault plane of N 50° W strike and E 60° dip. Lithologically, the argillite is similar to that of the *Hollandites* Beds of Inai, near Ishinomaki in the same province, though less sandy and more clayey.

The *Daonella* Beds are divided to

the upper division—Upper *Daonella* Beds

the lower division—Lower *Daonella* Beds, which comprises

Monophyllites Zone

Ptychites Zone

Fossils found in them are tabulated below :

	P	M	U
<i>Monophyllites</i> cfr. <i>wengensis</i> Klipstein	r	c	r
M. ? nov. sp. indet.	—	r	—
<i>Ptychites compressus</i> nov. sp.	c	—	—

		P	M	U
<i>P.</i>	sp. indet. α	r	—	—
<i>P.</i>	sp. indet. β	(r)		—
<i>P.</i>	sp. indet. γ	—	r	—
<i>P.</i>	<i>rifunus</i> nov. sp.	r	r	—
<i>Beyrichites chitani</i> nov. sp.		—	r	—
<i>Arpadites</i> (?) sp. indet.		(r)		—
<i>Ceratites</i> (<i>Paraceratites</i>) aff. <i>trinodosus</i> Mojs.		(r)		—
<i>C. (P.)</i>	cfr. <i>wardi</i> Smith	—	r	—
<i>C. (P.)</i>	<i>orientalis</i> nov. sp.	c	—	—
<i>C. (Gymnotoceras)</i>	<i>paucicostatus</i> nov. sp.	c	—	—
<i>Daonella kotoi</i> Mojs. var. <i>multistriata</i> nov. var.		—	c	vc
<i>D.</i>	<i>densisulcata</i> nov. sp.	—	c	vc

(P, *Ptychites* Zone; M, *Monophyllites* Zone; U, Upper *Daonella* Beds;
r, rare; c, common; vc, very common)

First of all, the occurrence of *Ptychites*, *Beyrichites* and *Ceratites* in our fauna decidedly points to its age as the Middle Triassic. Secondly, there are four species which are related to foreign Ladinic forms, namely, *Monophyllites* cfr. *wengensis*, almost indistinguishable from *M. wengensis*, *Ptychites rifunus* closely allied to *P. angustumbilicatus*, *C. (Paraceratites)* cfr. *wardi*, akin to *C. (P.) wardi* of the *Daonella dubia* Zone of Nevada, and *C. (P.) hungaricus* of the Alps, and a species of *Arpadites*, which is a genus almost confined to the Ladinic. Thirdly, the fauna of our *Daonella* Beds has certainly a younger aspect than, and can not be as old as, the fauna of the *Hollandites* Beds which is Anissic in age. It is rather striking that the two formations have no related species, except a *Ptychites*, between them.

There is the least doubt, we think, about the Ladinic age of the upper division of our *Daonella* Beds and the *Monophyllites* Zone of the lower division of the formation. It is, however, by no means excluded that the *Ptychites* Zone, considered alone, may possibly be the youngest Anissic or rather represent a passage bed from the Anissic to the Ladinic of the standard division of the Mediterranean Triassic. As we are of opinion that our *Daonella* Beds represent a single geological

formation, the complex, as a whole, may better be regarded as Ladinic in age. This formation, we believe, is equivalent to the *Daonella dubia* Zone of Nevada, which contains, according to J. P. Smith, Ladinic elements as well as many Anissic survivals.

While the fauna of the *Hollandites* Beds of Inai is essentially Himalayan in type, that of the *Daonella* Beds is partly Himalayan and partly Nevadian. Moreover, the latter contains *Ptychites compressus*, closely related to *P. kokeni* of the Ussuriland and a species of *Gymnotoceras*, which is a genus characteristic of the northern region and is also represented in the *Daonella dubia* Zone of Nevada. In a certain sense, therefore, our Ladinic fauna is just intermediate between the Anissic fauna of the *Hollandites* Beds and the Noric fauna of the *Pseudomonotis ochotica* Beds.

The details of the Triassic fauna will be given in a forthcoming number of the Science Reports of the Tôhoku Imperial University, second Series (Geology).