# Medaka on the move

Long before it found favor with geneticists—long before there were geneticists, in fact—the Japanese medaka (*Oryzias latipes*) was bred by hobbyists throughout Japan. As shown here in an 1843 drawing by Bai-en Mohri, there are differently pigmented strains of medaka that enhance their aesthetic appeal, including those now recognized as wildtype (brown) and mutant (orange-red and white) varieties. The orange-red medaka harbors a mutation at the *b* locus, and on page 381, Shoji Fukamachi and colleagues[1] describe a series of mutations in a new gene at this locus, encoding a putative sucrose transporter. The identification of the molecular lesion(s) in the *b* mutant is not only of historical interest, but also marks the first positional cloning of a gene in this model organism.

It has already been a good year for medaka mavens. Results reported in the last 12 months include: high-efficiency generation of embryonic mutants in ethylnitrosourea-based screens[2], a detailed linkage map[3], evidence for *de novo* transposition of the medaka Tol2 transposable element[4], cloning by nuclear transfer[5], and construction of a bacterial artificial chromosome (BAC) library derived from the inbred Hd-rR strain[6]. The medaka has also had its share of historical firsts, most notably as the first vertebrate in which Mendelian inheritance was demonstrated[7], and, in a less weighty turn, as the first vertebrate to reproduce successfully in microgravity[8]. The merits of medaka as an experimental organism have been summarized[9], and the recent flurry of reports, including that of Fukamachi and colleagues[1], suggests that a critical mass of essential genetic resources has at last been assembled (see http://biol1.bio.nagoya-u.ac.jp for a compendium of medaka resources).

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The *b* mutant analyzed by Fukamachi *et al.* lacks melanin pigment in its melanophores, but its orange, white and silver chromatophores are normally pigmented, resulting in the characteristic orange-red color. The *b* locus was previously narrowed down to a manageably small candidate region, and was cloned by recombination mapping between two medaka strains that are highly polymorphic, an effort that was facilitated by the recently published BAC library[6]. Seven of eight *b* alleles have mutations in the coding region; the lone exception is the original *b* mutant, which may have a mutation in a regulatory element.

What is B? Results from database queries predict a 12-pass integral membrane protein. It seems to be expressed in melanophores, but not exclusively, suggesting a possible function outside of melanogenesis. Indeed, as mouse pigmentation mutants have been a boon to vertebrate biology[10], providing insight into several cell lineages, there is ample precedent for such proteins to have a number of roles. The biggest hint in regard to B comes from its 23% amino-acid sequence identity with plant sucrose transporters. Fukamachi *et al.*[1] have put forward a plausible scenario whereby sucrose transport could affect melanin synthesis, but a real understanding of the origin of the orange-colored medaka awaits functional studies on the B protein. At the very least, however, it's a pleasing and appropriate coincidence that B might have a role in sugar metabolism. If the medaka put Mendel on the map with respect to vertebrate genetics, recall one of the original sources of Mendel's laws: the pea plant *r* locus, which encodes a starch-branching enzyme that determines whether pea seeds are round or wrinkled[11]. □

*—Alan Packer*


1. Fukamachi, S., Shimada, A. & Shima A. *Nature Genet.* **28**, 381–385 (2001).
2. Loosli F. *et al. Mech. Dev.* **97**, 133–139 (2000).
3. Naruse, K. *et al. Genetics* **154**, 1773–1784 (2000).
4. Koga, A. & Hori, H. *Genetics* **156**, 1243–1247 (2000).
5. Wakamatsu, Y. *et al. Proc. Natl. Acad. Sci. USA* **98**, 1071–1076 (2001).
6. Matsuda, M. *et al. Genes Genet. Syst.* **76**, 61–63 (2001).
7. Koyama, T. *Nihon Ikushugaku Kaiho* (in Japanese)
8. Ijiri, K. *Fish Biol. J. Medaka* **7**, 1–10 (1995).
9. Ishikawa, Y. *BioEssays* **22**, 487–495 (2000).
10. Silvers, W.K. *The Coat Colors of Mice: A Model for Mammalian Gene Action and Interaction* (Springer, Berlin, 1979).
11. Bhattacharyya, M.K., Smith, A.M, Ellis, T.H., Hedley, C. & Martin, *C. Cell* **60**, 115–122 (1990).