Supporting Information

Ziv et al. 10.1073/pnas.1201423109

SI Discussion

Impacts of Dams on Upstream Fisheries and Downstream Habitat Quality. Beyond blocking migration routes, hydropower dams can have numerous other upstream and downstream impacts (1–3). Dams alter the habitat of nonmigratory fish species, risk extinction of local endemic populations, reduce sediment and nutrient flows toward downstream habitats, river deltas, and estuaries, impact water quality and temperature downstream, cause eutrophication and deoxygenation by decomposing organic matter, and even emit greenhouse gas from their reservoirs. Damming might also change the timing of hydrological cues that set the onset of fish migration. Many of these impacts depend on the dam's design and operation. In this work we choose to concentrate on the unique aspect of the Mekong River Basin (MRB) fisheries, namely their reliance on migratory fish species. Thus, our findings are conservative because migratory—as well as nonmigratory—fish will have to struggle with additional dam-related issues not covered by our model.

Climate Change and Other Anthropogenic Drivers. The impact of climate change and demographic growth by the year 2030 has recently been the focus of a detailed study (4). From the projected rainfall and evapotranspiration patterns, it is estimated that the Mekong River runoff will increase by roughly 21%. This increase is mainly because of wet-season runoff, with dry-season runoff nearly unchanged (or slightly decreased) across most of the MRB. In our model, these changes would reflect in a small (∼10% in most catchments) decrease in f_i. For the Basin Development Plan 2 (BDP2) Definite Future scenario, the decrease in migratory species' relative abundance would roughly translate into a 18% decrease in floodplain fish productivity. Nevertheless, the additional biomass loss because of the 27 tributary dams planned by 2030 would not change (∼39% decrease instead of ∼36% decrease). Thus, although climate change would have significant impacts on flood risk and food scarcity (4), the potential deleterious impacts of tributary dams would still be a major concern.

Net runoff, evapotranspiration from nonagricultural land, and rain-fed agriculture constitute ∼82% of the water use in the MRB. Of the remaining 18%, most of the water is used for irrigation (16%), and the remaining 2% is for domestic (0.8%) and industrial (1.2%) use (4). Although the population is expected to grow to ∼111 million by 2030, this growth would not change these numbers significantly (4). Furthermore, because almost all arable land in the MRB is already cultivated, we do not foresee net runoff to decrease much because of further land use change.

1. Rosenberg DM, et al. (1997) Large-scale impacts of hydroelectric development. *Environ Rev* 5:27–54.
2. Rosenberg DM, McCully P, Pringle CM (2000) Global-scale environmental effects of hydrological alterations: Introduction. *Bioscience* 50:746–751.
3. Marmulla G (2001) *FAO Fisheries Technical Paper. no. 419*, ed Marmulla G (FAO, Rome, Italy).
4. Eastham J, et al. (2008) *Mekong River Basin Water Resources Assessment: Impacts of Climate Change* (Commonwealth Scientific and Industrial Research Organisation, Clayton South, Australia).

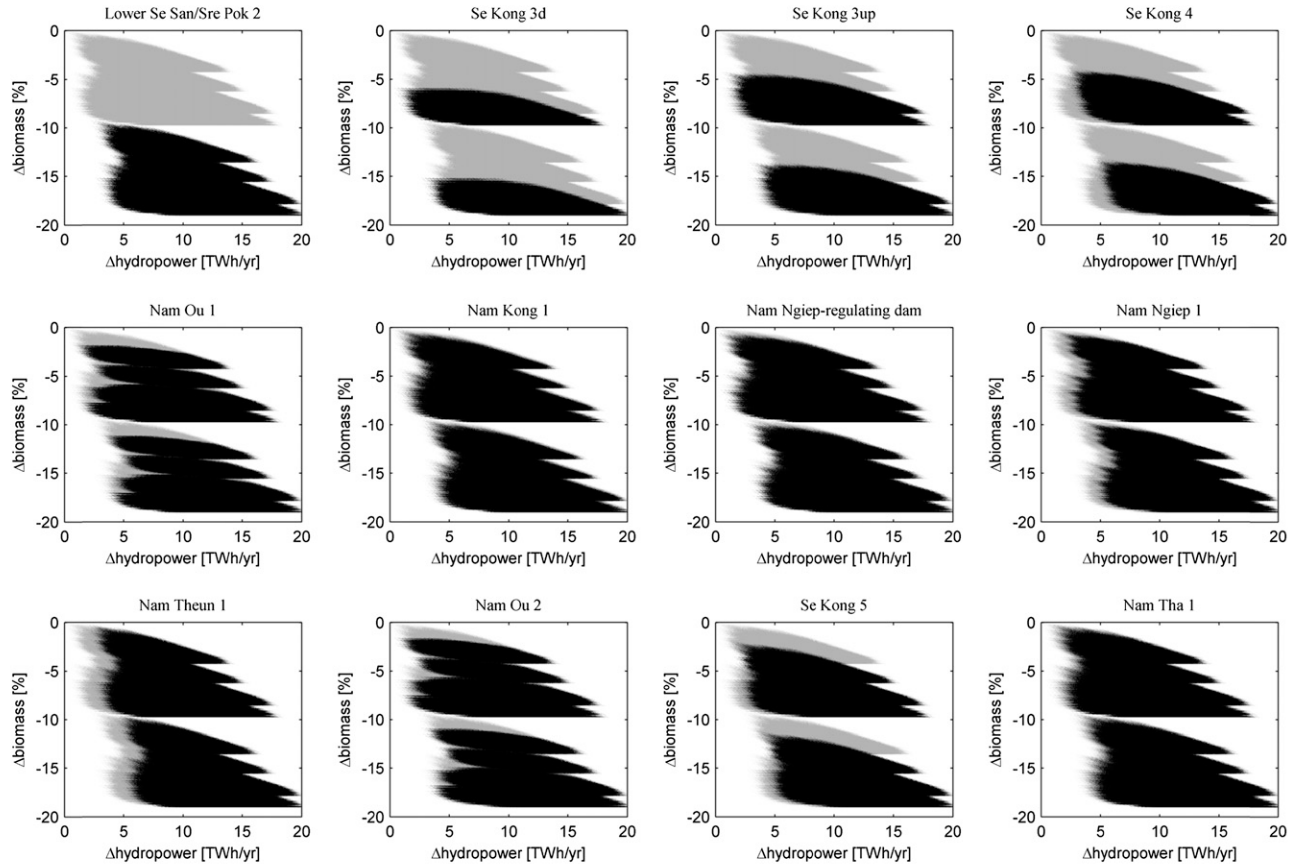

Fig. S1. (Continued)

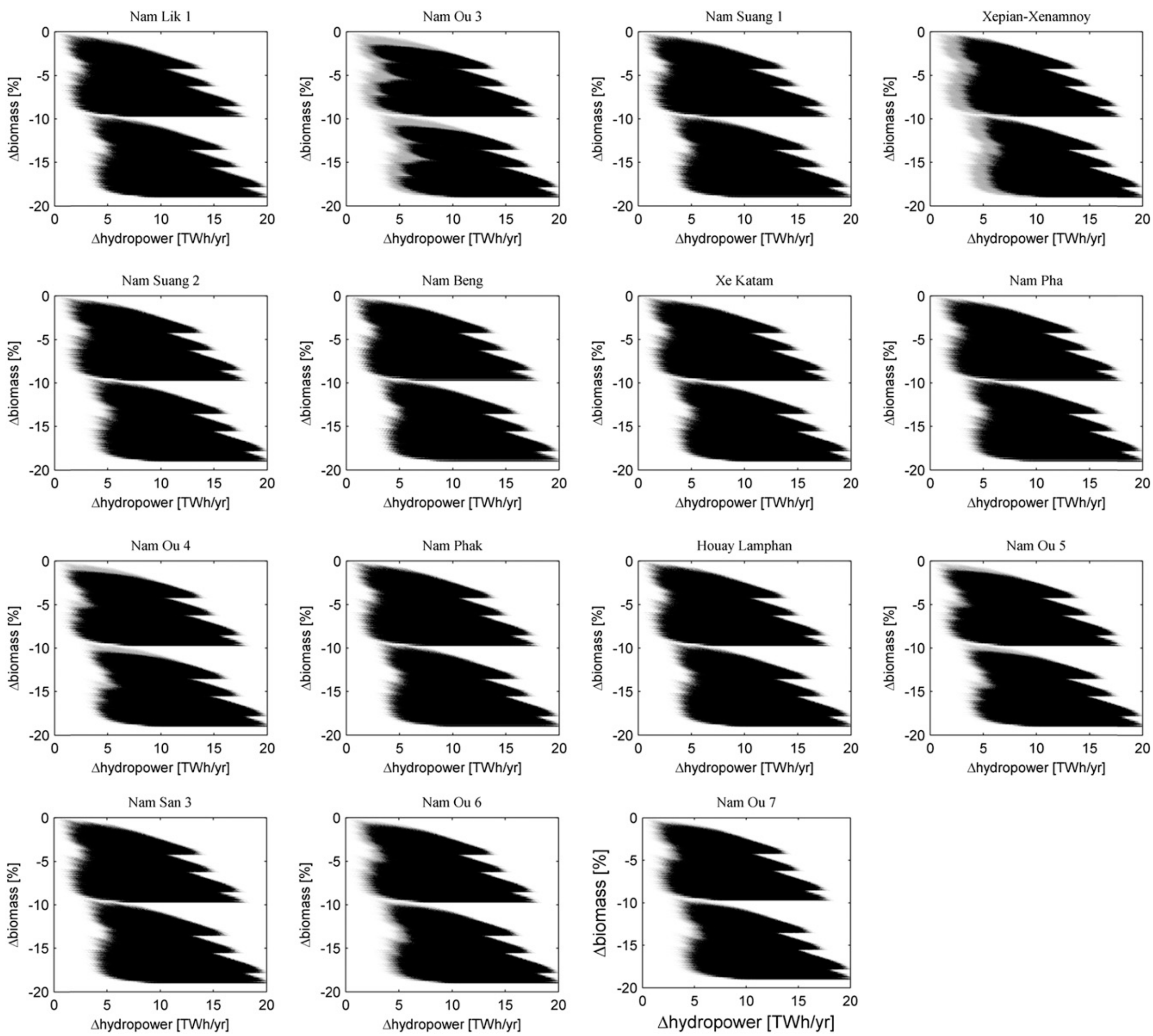

Fig. S1. Trade-off analysis between hydropower generation and fish biomass for all 27 dams on Mekong tributaries. Scenarios including each particular dam are marked black. Scenarios without the dam are drawn in gray. All dams, except Lower Se San 2 (LSS2) and the dams on the Se Kong River (Se Kong 3d, Se Kong 3u, Se Kong 4, and Se Kong 5) have some scenarios in all areas I to VIII, defined in Fig. 2*A*.

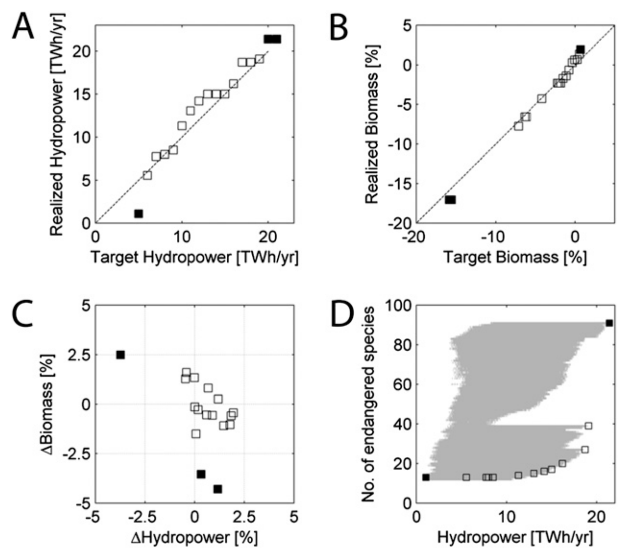

Fig. S2. Testing decision-tool for dam design. Comparison of "target" and "realized" results of using the threshold rule. *A* and *B* show the realized vs. target energy production (*A*) or fish biomass (*B*), which are within 2.5% (*C*) deviation for all but three scenarios (black symbol, corresponding to target energy level below 5 TWh/y and above 20 TWh/y. *D* shows that those scenarios, which are optimized based on trade-off between biomass loss and hydropower production, also achieves good conservation goals, with all scenarios falling close to the "Pareto-Efficient" scenarios (PESN) of Fig. 2*B*. Fig. S3 compares this optimal trade-off analysis to other dams ranking options.

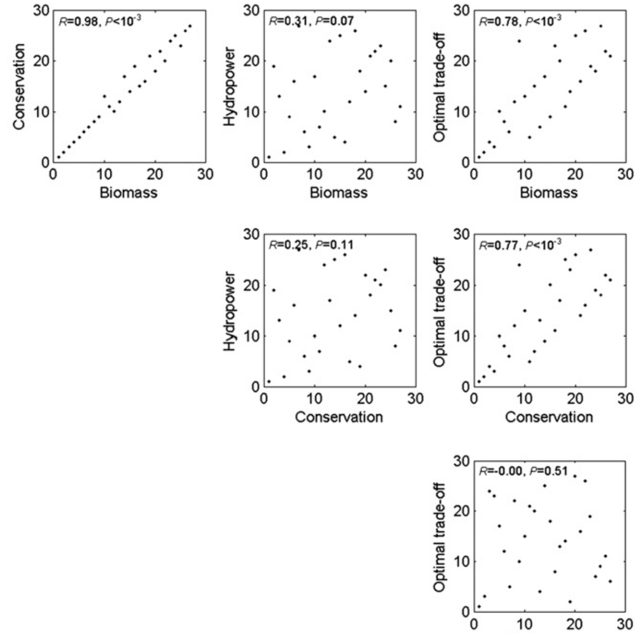

Fig. S3. Comparison of different dam projects ranking. As an alternative to our optimal trade-off analysis, decision-makers may use individual the dam's impacts to decide which dams to avoid. Here we show three other rankings and compare them to the optimal trade-off results. First, each of the 27 dams planned by 2030 was ranked according to four different perspectives: (*i*) Impact on floodplain fish production (Biomass, third column in Table S2); (*ii*) Impact on fish species richness (Conservation, fifth column in Table S2); (*iii*) Impact based on amount of hydropower produced (Hydropower, assuming larger plants have larger impacts); and (*iv*) Our optimized trade-off analysis (Fig. 3: ranking starts at LSS2 and continues upwards). We plot all pair-comparisons, as well as Pearson's R coefficient and P value (calculated by bootstrapping, n = 27). We find that none of the other ranking methods would give the same recommendations as our optimal trade-off decision-tool, although conservation and biomass do correlate with the optimal trade-off ranking.

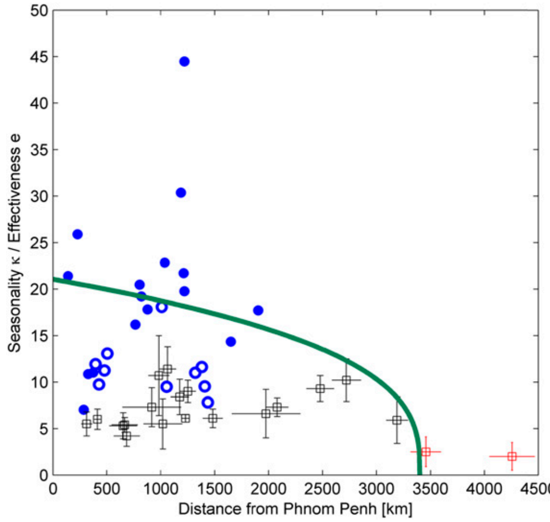

Fig. S4. Distance dependence of migration effectiveness. The migration effectiveness *e(d)* is the number of successfully returning offspring per individual migrant, and is a function of the distance *d* (measured for convenience in kilometers from Phnom Penh). For two subbasins (China upper reach and China headwaters, red squares) we find no migratory species, which by our theoretical model requires that $e(d) < \kappa$ for these habitats. For the other subbasins we demand that $e(d) > \kappa$ so migration is maintained (black squares). Each square symbol shows the average (and SD) of one subbasin's seasonality κ. The fraction of migratory species (*f*) is also known at several villages along the Mekong main stem and some tributaries (Table S4). From these, and the respective seasonalities at each village location, the local migration effectiveness is estimated in main-stem villages (filled circles) and tributary villages (empty circles). The function $e(d) \equiv 1.4 \cdot (3400 - d)^{1/3}$ (green line) was adjusted to obey the abovementioned inequalities and pass through the average value of all points. (The exact functional form for *e*(*d*) is unimportant, as it does not change any of the conclusions in this article.)

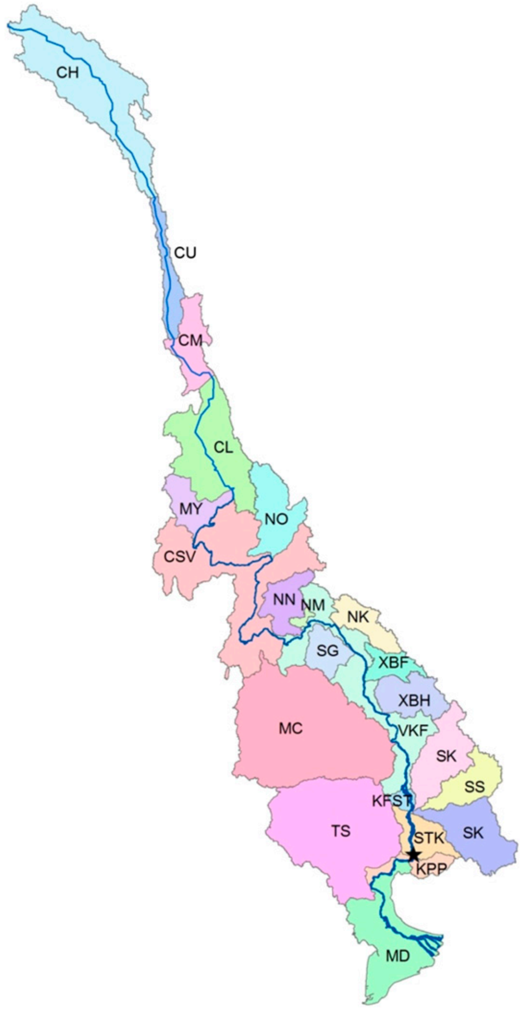

Fig. S5. Subbasins of the lower and upper Mekong. CH, China headwaters; CL, China lower reach; CM, China middle reach; CSV, main-stem Chiang Saen to Vientiane; CU, China upper reach; KFST, main-stem Khone Falls to Stung Treng; KPP, main-stem Kratie to Phnom Penh; MC, Mun/Chi; MD, Mekong Delta; MY, Myanmar Mekong; NK, Nam Kadinh; NM, Nam Mang; NN, Nam Ngum; NO, Nam Ou; SG, Songkhram; SK, Se Kong; SP, Sre Pok SS, Se San; STK, main-stem Stung Treng to Kratie; TS, Tonle Sap; VKF, main-stem Vientiane to Khone Falls; XBF, Xe Bang Fai; XBH, Xe Bang Hiang. Kratie (star) marks the upper limit of wet-season floodplains.

Table S1. Number of Mekong fish species in basin and subbasin level

Subbasin	Number of fish species (no. migratory species)	Subbasin	Number of fish species (no. migratory species)
Mekong Delta	484 (76)	Sre Pok	240 (82)
Tonle Sap	328 (96)	Se San	133 (54)
Main-stem, Stung Treng–Kratie	204 (77)	Se Kong	213 (65)
Main-stem, Khone Falls–Stung Treng	190 (76)	Mun/Chi	266 (89)
Main-stem, Vientiane–Khone Falls	191 (79)	Xe Bang Fai	157 (38)
Main-stem, Chiang Saen–Vientiane	140 (45)	Xe Bang Hiang	160 (46)
China lower reach	122 (20)	Songkhram	214 (69)
China middle reach	48 (4)	Nam Theun/Nam Kadinh	97 (18)
China upper reach	34 (0)	Nam Mang	57 (10)
China headwaters	24 (0)	Nam Ngum	155 (38)
		Nam Ou	136 (38)

We compiled 70 publications and references into a list of species in 21 Mekong subbasins and main-stem sections. We identified 877 unique species in the entire MRB, from which 103 are long-distance migratory species potentially impacted by dam construction. This table shows the total number of species and the number of migratory species (in parenthesis) in each subbasin and in sections of the main stem. The complete list of sources and species is available upon request. See Fig. S5 for geographic location of each subbasin.

Table S2. Impact of individual dams on fish productivity and biodiversity

Dam	Average Δ(migratory biomass) (%)	Rank (impact on fish biomass)	Average Δ (number of newly endangered species)	Rank (impact on fish species richness)
Lower Se San 2	9.29	1	56.29	1
Se Kong 3d	2.29	2	9.42	2
Se Kong 3up	0.90	3	3.47	3
Se Kong 4	0.75	4	3.02	4
Nam Ou 1	0.49	5	1.99	5
Nam Kong 1	0.35	6	1.77	6
Nam Ngiep-regulating dam	0.28	7	1.76	7
Nam Ngiep 1	0.28	8	1.70	8
Nam Theun 1	0.26	9	1.43	9
Nam Ou 2	0.26	10	0.86	12
Se Kong 5	0.25	11	0.93	11
Nam Tha 1	0.22	12	1.33	13
Nam Lik 1	0.22	13	0.89	10
Nam Ou 3	0.16	14	0.46	15
Nam Suang 1	0.13	15	0.76	17
Xepian-Xenamnoy	0.11	16	0.36	18
Nam Suang 2	0.10	17	0.49	14
Nam Beng	0.07	18	0.49	20
Xe Katam	0.06	19	0.19	16
Nam Pha	0.06	20	0.40	22
Nam Ou 4	0.05	21	0.15	19
Nam Phak	0.03	22	0.23	21
Houay Lamphan	0.03	23	0.10	25
Nam Ou 5	0.03	24	0.06	23
Nam San 3	0.02	25	0.13	24
Nam Ou 6	0.01	26	0.02	26
Nam Ou 7	0.01	27	0.01	27

For each of the 27 dams we calculate the difference between mean fish biomass and number of endangered species in all scenarios with and without that dam. Dams are ranked starting at the worst dam (i.e., the one having the largest impact). The correlation between average fish biomass loss and average number of endangered species is nearly 1 (Pearson $R = 0.996$, $P < 0.001$, $n = 27$).

Table S3. Presence and absence data of migratory species

Latin name	STK	KFST	VKF	CSV	CL	CM	CU	CH	SP	SS	SK	MC	XBF	XBH	SG	NK	NM	NN	NO
Aaptosyax grypus	●	●	●	○	○	○	○	○	○	●	○	●	○	○	●	○	○	○	●
Acanthopsoides delphax	○	○	●	●	○	○	○	○	●	●	○	●	●	○	●	○	○	○	○
Amblyrhynchichthys truncatus	○	●	●	●	○	○	○	○	●	○	●	●	○	○	●	○	●	●	○
Anguilla marmorata	●	●	●	●	○	○	○	○	●	○	●	●	○	○	●	●	○	○	●
Bagarius yarrelli	●	●	●	●	●	●	○	○	●	●	●	●	●	●	●	●	○	●	●
Bangana behri	●	●	●	○	○	○	○	○	●	●	●	●	○	○	○	○	○	●	●
Bangana pierrei	●	○	●	○	○	○	○	○	○	○	●	●	●	○	○	●	○	○	●
Barbichthys laevis	●	●	○	○	○	○	○	○	●	○	○	●	○	○	●	○	○	○	○
Brachirus harmandi	●	●	●	○	○	○	○	○	●	○	●	●	●	●	●	○	○	●	○
Catlocarpio siamensis	●	●	●	●	○	○	○	○	○	○	●	●	○	○	●	○	○	○	●
Chitala blanci	●	●	●	●	○	○	○	○	●	●	●	●	●	●	●	○	○	●	●
Cirrhinus caudimaculatus	●	○	○	○	○	○	○	○	○	○	○	●	○	○	●	○	○	○	○
Cirrhinus jullieni	●	●	●	●	○	○	○	○	●	●	●	●	○	○	○	○	○	○	○
Cirrhinus microlepis	●	●	●	○	○	○	○	○	●	●	●	●	●	○	●	○	○	○	○
Cirrhinus molitorella	●	●	●	●	●	○	○	○	●	●	●	●	●	●	●	●	●	●	●
Clupisoma sinense	○	●	●	○	●	●	○	○	●	●	○	●	○	○	○	●	○	●	○
Cosmochilus harmandi	●	●	●	●	○	○	○	○	●	●	●	●	○	●	●	○	○	●	●
Crossocheilus atrilimes	●	○	●	●	○	○	○	○	●	●	●	●	●	●	○	○	●	●	○
Crossocheilus reticulatus	●	●	●	○	●	○	○	○	●	●	●	●	●	●	●	○	●	●	●
Cyclocheilichthys apogon	●	●	●	●	○	○	○	○	●	○	●	●	●	●	●	○	○	●	○
Cyclocheilichthys armatus	●	●	●	●	○	○	○	○	●	●	●	●	●	○	●	○	○	●	○
Cyclocheilichthys enoplus	●	●	●	○	○	○	○	○	●	●	●	●	○	●	●	○	○	●	○
Cyclocheilichthys furcatus	●	●	●	●	○	○	○	○	●	○	○	●	○	○	●	○	○	○	○
Cyclocheilichthys heteronema	●	○	○	○	○	○	○	○	●	○	○	●	○	○	○	○	○	○	○
Cynoglossus microlepis	●	●	●	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○
Dasyatis laosensis	○	●	●	●	○	○	○	○	●	●	●	●	○	○	●	○	○	○	●
Datnioides undecimradiatus	●	●	●	○	○	○	○	○	●	●	●	●	●	●	●	○	○	○	○
Epalzeorhynchos frenatus	●	●	●	○	○	○	○	○	○	○	●	●	●	●	●	○	○	○	○
Epalzeorhynchos munense	●	○	○	●	○	○	○	○	○	○	○	●	●	○	●	○	○	●	○
Garra fasciacauda	○	●	●	●	○	○	○	○	●	○	●	●	●	●	○	●	○	○	○
Gyrinocheilus pennocki	●	●	●	○	○	○	○	○	●	●	●	●	○	●	●	●	○	○	○
Helicophagus leptorhynchus	●	○	○	●	○	○	○	○	○	○	○	●	○	●	○	○	○	●	●
Helicophagus waandersii	○	●	●	●	○	○	○	○	●	●	●	●	○	●	●	○	○	○	○
Hemibagrus filamentus	●	●	○	●	○	○	○	○	●	●	●	●	●	●	●	○	○	●	○
Hemibagrus wyckii	●	●	●	●	○	○	○	○	●	●	●	●	○	○	●	○	○	●	●
Hemibagrus wyckioides	●	●	●	●	●	○	○	○	●	●	●	●	○	●	●	●	○	●	●
Hemisilurus mekongensis	●	●	●	○	○	○	○	○	●	○	○	●	○	○	●	○	○	○	●
Henicorhynchus lobatus	●	●	●	○	○	○	○	○	●	●	●	●	●	○	●	○	○	●	●
Henicorhynchus siamensis	●	●	●	○	○	○	○	○	●	●	●	●	●	●	●	●	●	●	●
Himantura krempfi	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○
Hypsibarbus lagleri	●	●	●	●	○	○	○	○	●	●	●	●	○	●	●	○	○	○	○
Hypsibarbus malcolmi	●	●	●	○	○	○	○	○	●	●	●	●	○	●	●	○	○	○	●
Hypsibarbus pierrei	●	●	●	●	●	○	○	○	●	○	○	●	○	○	○	○	○	○	○
Hypsibarbus vernayi	○	○	○	○	●	○	○	○	○	○	○	●	●	○	●	●	○	○	○
Hypsibarbus wetmorei	●	●	●	○	○	○	○	○	●	●	●	●	○	●	●	○	○	○	●
Labiobarbus leptocheilus	○	●	●	○	○	○	○	○	○	●	●	●	●	○	●	○	○	●	●
Labiobarbus lineatus	○	○	○	●	●	○	○	○	○	●	○	●	●	●	●	○	●	○	○
Labiobarbus siamensis	●	●	●	●	○	○	○	○	●	○	○	●	○	○	●	○	○	○	○
Leptobarbus hoevenii	●	●	●	○	○	○	○	○	●	●	●	●	○	●	○	○	○	○	○
Lobocheilos cryptopogon	○	●	○	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○
Lobocheilos melanotaenia	●	●	●	○	●	○	○	○	●	●	●	●	●	○	○	○	○	●	○
Luciocyprinus striolatus	○	○	○	●	●	○	○	○	○	○	●	○	○	○	○	●	○	●	●
Luciosoma bleekeri	●	●	●	○	○	○	○	○	●	●	●	●	○	○	●	○	○	●	○
Mekongina erythrospila	●	●	●	○	○	○	○	○	●	●	●	●	●	●	○	●	○	○	●
*Osteochilus enneaporos**	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Osteochilus microcephalus	●	●	●	●	○	○	○	○	●	●	●	●	○	●	●	○	○	●	○
Osteochilus schlegelii	●	○	●	○	○	○	○	○	●	○	○	○	○	○	○	○	○	●	○
Osteochilus waandersii	●	●	●	○	○	○	○	○	●	●	●	●	●	○	●	○	●	●	○
Pangasianodon gigas	●	●	●	●	○	○	○	○	●	○	○	●	○	○	●	○	○	○	●
Pangasianodon hypophthalmus	●	●	●	●	○	○	○	○	●	●	●	●	○	○	●	○	○	●	●
Pangasius bocourti	●	●	●	○	○	○	○	○	●	●	●	●	○	○	●	○	○	○	○
Pangasius conchophilus	●	●	●	○	○	○	○	○	●	●	●	●	○	●	●	○	○	●	○
Pangasius djambal	○	●	●	○	○	○	○	○	●	○	○	●	○	○	○	○	○	○	○

Table S3. Cont.

Latin name	STK	KFST	VKF	CSV	CL	CM	CU	CH	SP	SS	SK	MC	XBF	XBH	SG	NK	NM	NN	NO
Pangasius elongatus	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Pangasius krempfi	●	●	●	●	○	○	○	○	●	●	●	●	○	○	○	○	○	○	○
Pangasius kunyit	○	○	●	○	○	○	○	○	●	○	○	●	○	○	○	○	○	○	○
Pangasius larnaudii	●	●	●	●	○	○	○	○	●	●	●	●	●	○	●	○	○	○	●
Pangasius macronema	●	●	●	○	○	○	○	○	●	●	●	●	○	●	●	○	○	●	●
Pangasius mekongensis	●	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○
Pangasius nasutus	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○
*Pangasius pangasius**	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Pangasius polyuranodon	○	●	●	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○
Pangasius sanitwongsei	●	●	●	●	●	○	○	○	○	○	○	●	○	○	●	○	○	○	●
Paralaubuca harmandi	○	○	○	○	○	○	○	○	●	○	○	●	○	○	●	○	○	○	○
Paralaubuca riveroi	●	○	●	○	○	○	○	○	●	○	●	●	○	○	●	○	○	○	○
Paralaubuca typus	●	●	●	●	○	○	○	○	●	●	●	●	●	●	●	○	○	○	○
Phalacronotus apogon	●	●	●	●	○	○	○	○	●	○	●	●	●	●	●	○	●	○	●
Phalacronotus bleekeri	●	●	●	○	●	○	○	○	●	●	●	●	○	●	●	○	○	●	○
Probarbus jullieni	●	●	●	○	○	○	○	○	●	●	●	●	○	●	●	○	○	○	●
Probarbus labeamajor	○	●	●	○	○	○	○	○	●	●	●	●	○	○	○	○	○	●	○
Probarbus labeaminor	●	●	○	○	○	○	○	○	●	○	○	●	●	○	●	○	○	○	○
Pseudolais micronemus	●	○	●	○	●	○	○	○	●	○	○	●	○	○	○	○	○	○	○
Pseudolais pleurotaenia	●	●	●	●	○	○	○	○	●	●	●	●	○	●	●	○	○	●	○
Puntioplites bulu	○	○	○	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○
Puntioplites falcifer	●	●	●	●	○	○	○	○	●	●	●	●	●	●	●	●	○	●	●
Puntioplites proctozystron	●	●	●	○	●	○	○	○	●	○	●	●	○	●	●	●	○	○	●
Puntioplites waandersi	○	○	○	○	●	○	○	○	○	○	○	●	○	○	●	○	○	○	○
Raiamas guttatus	●	●	●	●	●	●	○	○	●	●	●	●	●	●	●	●	○	○	●
Rasbora aurotaenia	●	●	○	○	○	○	○	○	●	○	○	●	○	○	●	○	○	○	○
Scaphognathops bandanensis	●	●	●	●	○	○	○	○	●	●	●	●	●	●	●	○	○	○	○
Scaphognathops stejnegeri	●	●	●	○	○	○	○	○	●	○	●	●	●	●	○	●	○	○	●
Setipinna melanochir	●	●	○	○	○	○	○	○	○	○	○	●	○	○	●	○	○	○	○
Sikukia gudgeri	●	●	●	○	○	○	○	○	●	○	●	●	●	●	●	○	○	○	●
Sikukia stejnegeri	●	○	○	●	●	○	○	○	○	○	○	●	○	●	○	○	○	○	○
Syncrossus beauforti	●	○	○	●	●	○	○	○	●	●	●	●	●	●	●	○	●	●	○
Syncrossus helodes	●	●	●	●	○	○	○	○	●	●	○	●	●	●	●	○	○	○	○
Tenualosa thibaudeaui	●	●	●	○	○	○	○	○	○	●	●	●	●	●	●	○	○	○	●
Tenualosa toli	○	○	●	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○
Thynnichthys thynnoides	●	●	●	●	○	○	○	○	●	●	●	●	○	●	●	○	○	○	○
Tor sinensis	○	○	●	●	●	●	○	○	●	○	●	○	●	○	○	●	○	●	○
Tor tambroides	○	●	●	●	○	○	○	○	●	○	●	○	○	●	○	●	●	●	●
Wallago leerii	○	●	●	●	○	○	○	○	●	●	●	●	○	●	●	○	○	●	●
Yasuhikotakia modesta	●	●	●	○	○	○	○	○	●	●	●	●	●	●	●	○	○	○	●

The presence (●) or absence (○) of each of the 103 species we identified as migrating upstream of Kratie toward 19 subbasins and main-stem sections. CH, China headwaters; CL, China lower reach; CM, China middle reach; CSV, main-stem Chiang Saen to Vientiane; CU, China upper reach; KFST, main-stem Khone Falls to Stung Treng; MC, Mun/Chi; NK, Nam Kadinh; NM, Nam Mang; NN, Nam Ngum; NO, Nam Ou; SG, Songkhram; SK, Se Kong; SP, Sre Pok SS, Se San; STK, main-stem Stung Treng to Kratie; VKF, main-stem Vientiane to Khone Falls; XBF, Xe Bang Fai; XBH, Xe Bang Hiang.

*These species have no specific subbasin data. Hence we could not evaluate their extinction risk because of damming, and they were removed from the analysis.

Table S4. Fraction of migratory species in different habitats

Village name	Distance to Phnom Penh (km)	Habitat type*	Percentage migratory fish biomass f†	Source‡	Seasonality κ
Sre Sronok	396	Tributary	43	AMCF	6.8
Pres Bang	428	Tributary	21	AMCF	7.7
Banfang	478	Tributary	44	AMCF	6.3
Day Lo	504	Tributary	61	AMCF	5.1
Khongpat	1008	Tributary	42	Warren	10.5
Ban Nam Ngieb	1056	Tributary	20	AMCF	7.6
Naxaeng§	1407	Tributary	35	Vattenfall	6.2
Xiengdet§	1436	Tributary	13	Vattenfall	6.8
Phonsavat§	1381	Tributary	57	Vattenfall	5.0
Songphatong§	1319	Tributary	40	Vattenfall	6.6
Pram	140	Main stem	57	AMCF	9.2
Sandan	229	Main stem	78	AMCF	5.7
Koh Khne	286	Main stem	29	AMCF	5.0
Kang Memai	328	Main stem	54	AMCF	5.0
Ou Run	375	Main stem	51	AMCF	5.4
Nalair	764	Main stem	58	AMCF	6.8
Song-khon	803	Main stem	58	AMCF	8.6
Ban Nam Kum	820	Main stem	37	AMCF	12.1
Ban Mouang Sum	877	Main stem	54	AMCF	8.2
Ban Xinh Xay	1038	Main stem	65	AMCF	8.0
Ban Thamuang	1187	Main stem	73	AMCF	8.2
Huasai	1213	Main stem	59	AMCF	8.9
Peam chumnik	1220	Main stem	80	AMCF	8.9
Pa-sak	1220	Main stem	55	AMCF	8.9
Ban Pha O	1649	Main stem	54	AMCF	6.6
Ban Done	1904	Main stem	56	AMCF	7.8
Phaphang	940	Wetlands	28	AMCF	6.1
Nongbueng	919	Wetlands	17	AMCF	8.5

Literature review values for percentage of migratory fish species along the Mekong River.

*AMCF listed habitat as main stem, tributary, or floodplain. To avoid confusion, we renamed the last category "wetland," to differentiate these from the wet-season habitat below Kratie.

†Calculation of f for AMCF data used total catch of guilds 2, 3, 8, and 9 divided by total catch. In Warren and Vattenfall, the total catch of species classified as "migratory" (Table S2) was divided by the overall catch.

‡Assessment of Mekong Capture Fisheries (AMCF): guild-level catch, monitored between December 2003 and November 2004 (1). Warren: Ecological Impact Assessment study in Nam Hinboum (2). Vattenfall: Ecological Impact Assessment in Nam Ngum subbasin (3).

§Distance measured along streamlines from Nam Lik 2 site, Nam Ngum 3 site, Nam Ngum 2 site, and Nam Ngum 1 site to Phnom Penh in Cambodia.

1. Halls A (2010) Estimation of annual yield of fish by guild in the Lower Mekong Basin (WorldFish Center, Phnom Penh, Cambodia).
2. Warren TJ (1999) A monitoring study to assess the localized impacts created by the Nam Theun-Hinboun hydro-scheme on fisheries and fish populations (Theun-Hinboun Power Company, Vientiane, Lao PDR).
3. Rydgren B, et al. (2009) Preparing the Cumulative Impact Assessment for the Nam Ngum 3 Hydropower Project (Asian Development Bank, Manila, Philippines).

Table S5. Relative abundance of migratory fish species in the Cambodian floodplains

Latin name	$c^{(m)}$	Latin name	$c^{(m)}$
Henicorhynchus lobatus	0.234025	*Cyclocheilichthys armatus*	0.0019
Lobocheilos cryptopogon	0.192042	*Luciosoma bleekeri*	0.000928
Henicorhynchus siamensis	0.144327	*Pangasius bocourti*	0.000734
Labiobarbus lineatus	0.095536	*Probarbus labeamajor*	0.000724
Puntioplites proctozystron	0.037989	*Hemibagrus wyckii*	0.000672
Thynnichthys thynnoides	0.036847	*Hemisilurus mekongensis*	0.000661
Cirrhinus microlepis	0.032626	*Catlocarpio siamensis*	0.000626
Labiobarbus siamensis	0.030607	*Clupisoma sinense*	0.000597
Cyclocheilichthys enoplus	0.029903	*Osteochilus schlegelii*	0.000468
Pangasius larnaudii	0.025448	*Puntioplites bulu*	0.000244
Yasuhikotakia modesta	0.021483	*Hemibagrus filamentus*	0.000178
Pseudolais pleurotaenia	0.018927	*Hypsibarbus vernayi*	0.000173
Syncrossus helodes	0.014678	*Cirrhinus jullieni*	0.000159
Amblyrhynchichthys truncatus	0.014298	*Pangasius sanitwongsei*	0.0001
Hypsibarbus malcolmi	0.012884	*Raiamas guttatus*	8.12E-05
Cosmochilus harmandi	0.009584	*Epalzeorhynchos frenatus*	7.49E-05
Pangasianodon hypophthalmus	0.009159	*Pangasius krempfi*	6.32E-05
Pangasius conchophilus	0.007945	*Epalzeorhynchos munense*	4.13E-05
Probarbus jullieni	0.007105	*Cyclocheilichthys furcatus*	3.55E-05
Helicophagus waandersii	0.004939	*Bagarius yarrelli*	2.81E-05
Barbichthys laevis	0.003411	*Pangasianodon gigas*	2.53E-05
Tenualosa thibaudeaui	0.002671	*Hypsibarbus wetmorei*	1.71E-05
Leptobarbus hoevenii	0.002562	*Bangana behri*	5.76E-06
Setipinna melanochir	0.002469	*Tenualosa toli*	4.48E-07

Species not listed in table are rare, or were otherwise not caught in the years and lots surveyed. Our analysis assumes the contribution of these to floodplains biomass is negligible. Values are based on total catch between 1998 and 2009 in stratified survey of fishing lots ("dais") along the Tonle Sap River, conducted as part of the Fisheries, Ecology Valuation and Mitigation component of the MRC Fisheries Program in cooperation with the Inland Fisheries Research and Development Institute.